# INTERMEDIATE MAP READING

by Thomas Pickles, B.Sc.

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# INTERMEDIATE MAP READING

THOMAS PICKLES

ILLUSTRATED WITH SIX EXTRACTS FROM
ORDNANCE SURVEY MAPS IN COLOUR,
FOUR PAGES OF HALF-TONE PLATES,
AND MANY LINE DRAWINGS
IN THE TEXT

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## THE MOORLAND MAP

Our maps are music and our northern titles,
Like wind among the grass and heather, grieve,
Our maps are candid charts of desolation
And wear the Pennine weather on their sleeve.

There 's Howl Moor, Wetshaw, Winterings, and Gutters,
Mirk Fell and Dirty Pool and Hagworm Hill,
Fog Close, Cold Syke, Ravock, and Crooks Altar,
And Loups and Wham and Whaw and Rotten Gill.

Our maps are music and they sing the miners'
Old wrestle with the rocks for yield of lead:
There 's Old Gang, Windegg, Eskeleth, and Crackpot,
And Racca Vein, forsaken. They are dead.

Our maps are music and they sing the farmers'
Long battle to wring fodder from the fell:
There 's Stony Mea and Nettlepot and Sour Nook,
There 's Pasture End and Halfpenny, and Farewell.

IVOR BROWN.

(From the *Observer* of 13th September 1942.)


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# PREFACE

THE aim of this book is to introduce the pupil to the wealth of information and enjoyment to be found in the reading of our Ordnance Survey maps.

The 'language' of maps needs to be learnt with care in order to develop facility in map-reading, and ample practice in the necessary forms of 'map-spelling' is provided by graded exercises whose variety will, it is hoped, retain the interest of the pupil. The grid system, for example, is introduced by easy stages, leading up to a full use of the grid in the later maps.

The chief object of the writer is, however, to afford the means of training the pupil to translate map symbols into clear and accurate mental pictures. With this end in view, considerable use has been made of aerial photographs, block diagrams, and illustrative sketches. An 'alphabet' of land forms is provided by a series of block diagrams, with accompanying contour maps; air-mosiac photographs, showing every feature of the accompanying Ordnance maps, provide the means of detailed comparison between map and picture; and each Ordnance map is illustrated by a block diagram emphasizing the dominant physical features of the area.

The elements of town study are first suggested by a 25-in. town plan and the corresponding oblique aerial photograph; and the subsequent Ordnance Survey maps on the scales of 6 in., $2\frac{1}{2}$ in., and 1 in., to the mile have been chosen to illustrate different types of country and to form a graded series suited to the capacity of the pupil.

The book will be found specially suitable for the middle forms of Grammar Schools, and for similar age groups in other types of schools, and the variety of scales of the Ordnance Survey maps will make the book a suitable introduction to the map reading required by the General Schools Examination.

The author is indebted to the publishers for their valuable assistance in seeing the book through the press, and to Ivor Brown, Esq., for permission to use the poem on page iv.

The full-page maps are reproduced from, and Figures 1, 2, 3, and 20 are based upon, the Ordnance Survey map with the sanction of the Controller of His Majesty's Stationery Office.

T. P.

*Barnsley.*

# MAPS AS SHORTHAND

A MAP is the shortest shorthand ever invented, and British Ordnance Survey maps are a form of graphic shorthand which combines great detail with beauty and clarity. Fig. 1 is a portion of a 6-in.-to-the-mile Ordnance Survey map, and below it is an account of the information it contains written in Pitman's shorthand. The account begins: 'Whitecliff Farm is situated about 150 ft. above sea level on a gentle slope facing south.'

Continue this account, writing down all the information you can find on the map, then get someone to transcribe the shorthand for you and compare the account with your own.

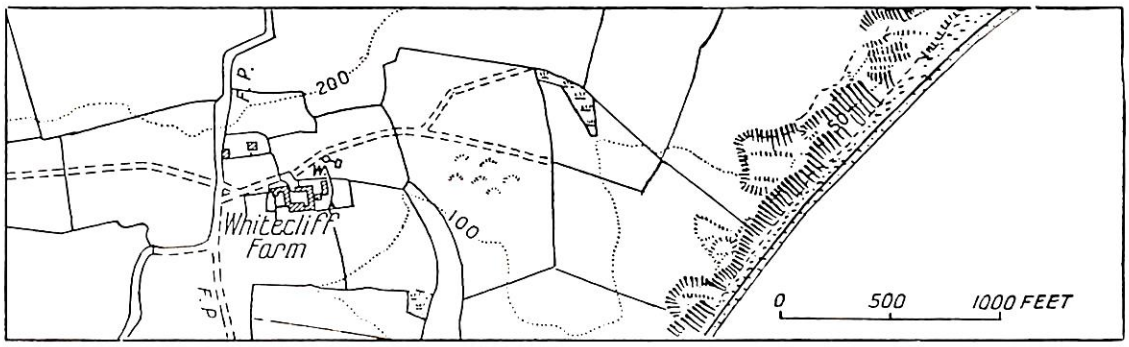
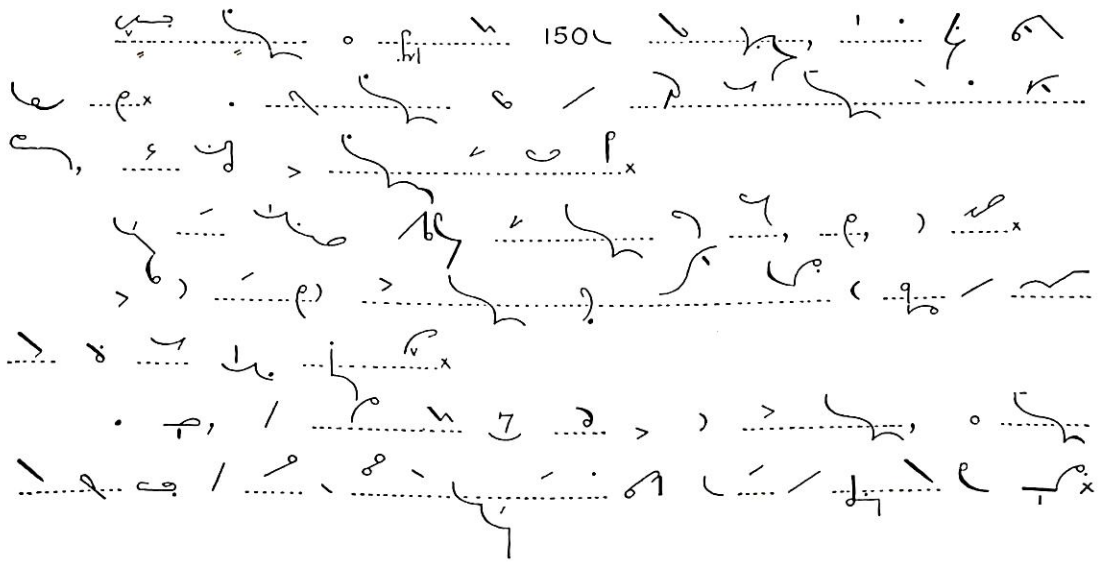



FIG. 1



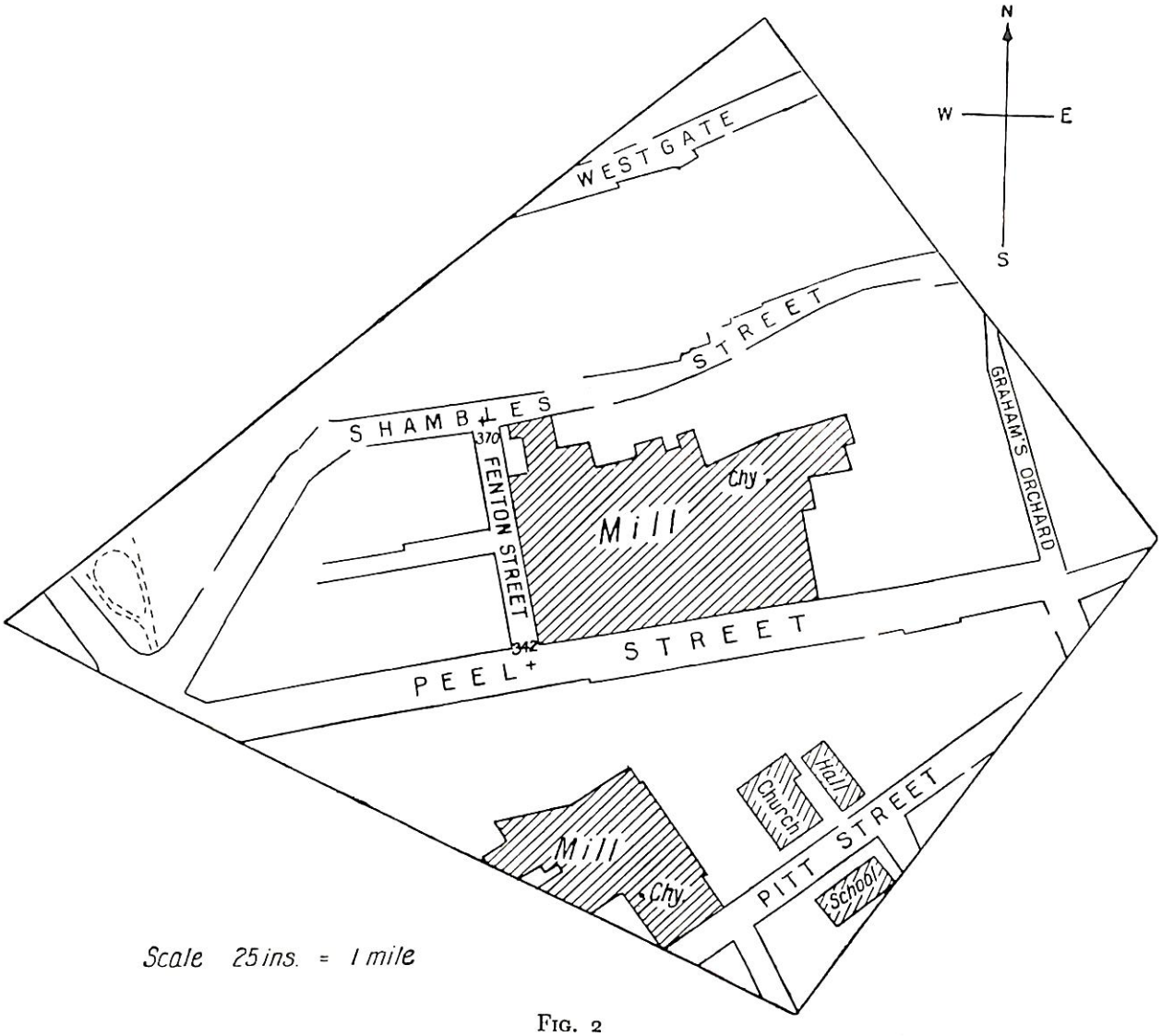



FIG. 2

## EXERCISES

(1) Fig. 2 is an outline map of the area shown in the aerial photograph on the opposite page. Pick out on the photograph the streets and buildings shown on the map.

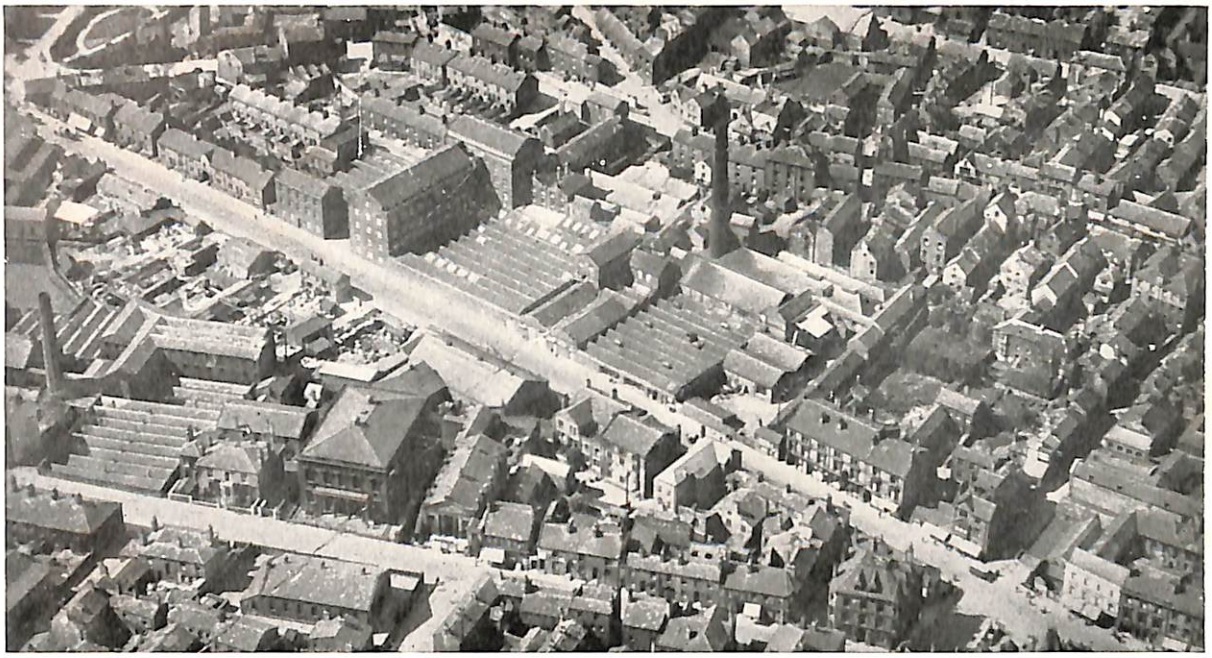
(2) State three ways in which this area of an industrial town differs from an agricultural market town, and three ways in which it differs from a residential suburb of a large town.

(3) Assuming that Pitt Street and Peel Street were built at the time Pitt and Peel were popular statesmen, find the approximate date of the buildings. What changes were then taking place in the industries of Britain? Why did people in those days need to live nearer their work than is necessary at the present time?

(4) The area between Peel Street, Shambles Street, and Fenton Street is $1\frac{3}{4}$ acres. How many houses can you count in that area? Assuming an average of four people per house, how many people live in that area? How many is that per acre? How many per square mile?

Compare this density of population with that in some other areas known to you.

(5) The large factory in Peel Street was built for the manufacture of textiles; the spinning process needs side light, and is, therefore, carried on in buildings of several storeys with many windows in the sides; weaving requires top light, and is, therefore, carried on in single-storey buildings with windows in the roof but not in the walls. Mark S and W on tracings of the map above for spinning and weaving factories.



*Aerofilms*

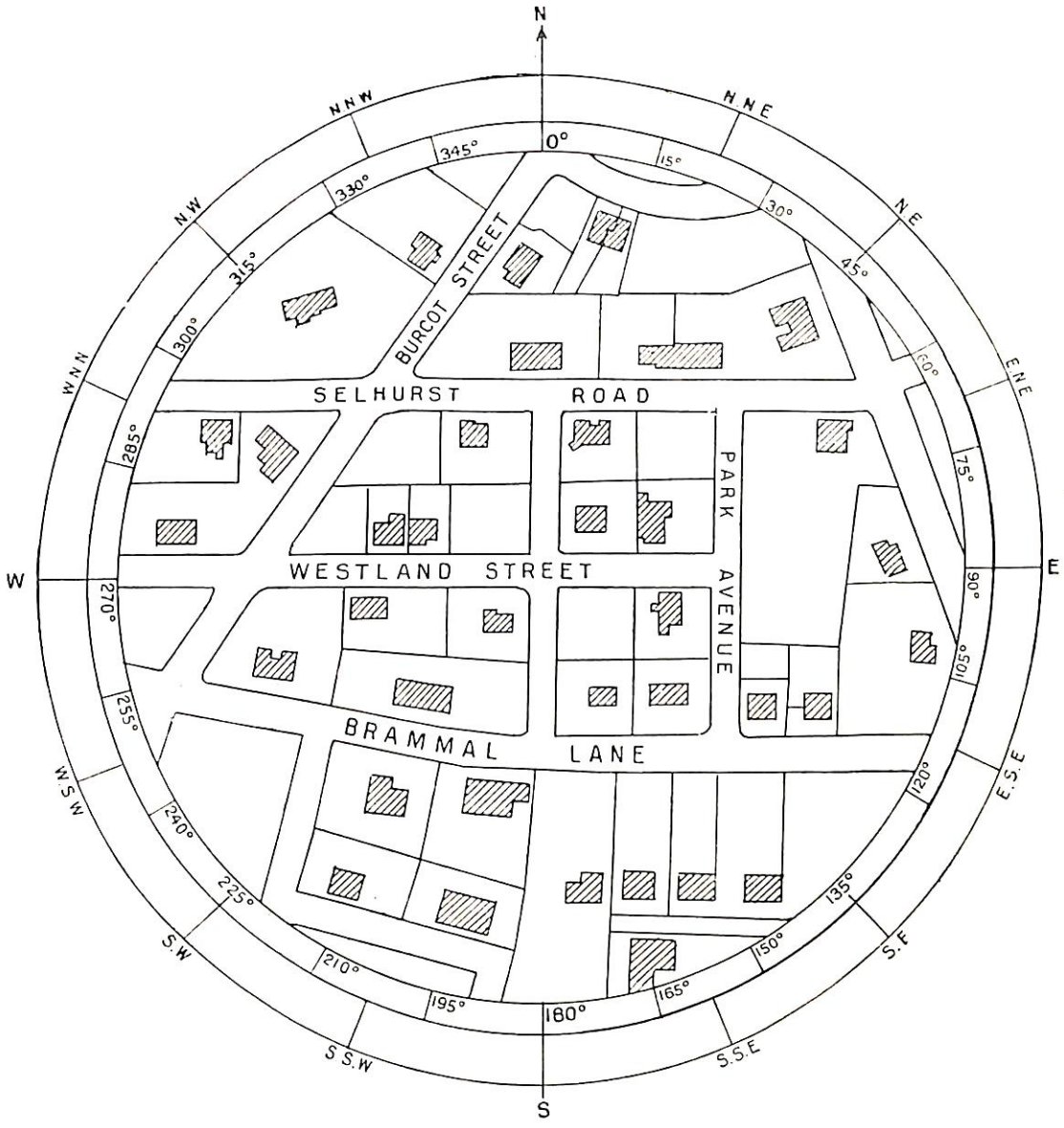
AN INDUSTRIAL TOWN FROM THE AIR

*S. T. Pickles*

STANAGE EDGE

(*See page 33*)

A RESIDENTIAL DISTRICT



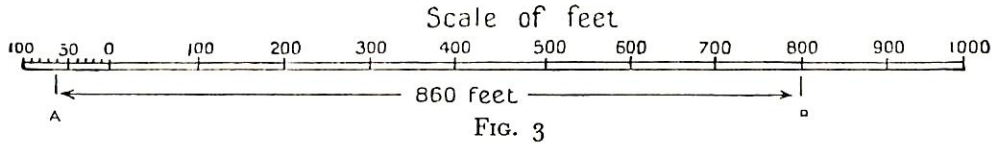




FIG. 3

## DIRECTION

There are two methods of stating the direction of one place from another:

(*a*) By compass points, and (*b*) by angular bearings.

**Compass points** are shown on the circumference of the circle on the map above. The *cardinal points* are: north, south, east, and west. Half-way between N. and W. is NW.; half-way between N. and NW. is NNW.; half-way between E. and SE. is ESE., and so on.

**Angular bearings** are a more accurate means of stating directions. Starting with N. as 0 degrees, E. is 90 degrees E., SE. is 135 degrees E., NW. is 315 degrees E., etc.

## ANGULAR BEARINGS

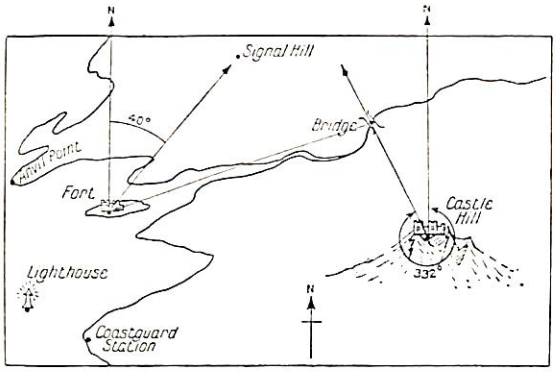



FIG. 4

In Fig. 4 the angular bearing of Signal Hill from the Fort is N. 40 degrees, and the bearing of the Bridge from Castle Hill is N. 332 degrees.

Using a protractor, or a tracing of the circle in Fig. 3, find the following angular bearings:

(1) **From the Fort:** (*a*) The Bridge; (*b*) Castle Hill; (*c*) the Lighthouse; (*d*) Anvil Point.

(2) **From Castle Hill:** (*a*) The Fort; (*b*) the Lighthouse; (*c*) the Coastguard Station.

(In each case the exact position of the feature is shown by the dot.)

## DISTANCES

To measure the distance between two points, A and B, on a map mark off the points on a straight edge of paper, then place the edge on the scale as in Fig. 3, so that B is on a whole number and A falls on the divided part of the scale. Then you can read off the distance immediately. From B you read '800 ft.' and from A '60 ft.,' making 860 ft.

## EXERCISES

From the map on p. 3 find the length in feet of (*a*) Park Avenue; (*b*) Brammal Lane; (*c*) the shortest distance by road from zero in the north of the map to bearing 220°.

## AREAS

When finding areas on a 25-in.-to-the-mile map it is best to measure in chains, since 10 sq. chains=1 acre. (1 chain=22 yds., 1 sq. chain=484 sq. yds., 10 sq. chains=4,840 sq. yds.=1 acre.)

*Example.* The square plot of ground on the angle between Selhurst Road and Park Avenue on map, Fig. 3, measures 3 chains by 3 chains (measuring to the footpath); its area, therefore, is 9 sq. chains, or nine-tenths of an acre.

Compare the housing density in this residential district with the density in the industrial district shown in Fig. 2.

Where it is necessary to measure a large area which has irregular boundaries an approximate answer can be quickly obtained by using a 'grid' of squares each a chain long, as shown in Fig. 5. Trace this grid on to transparent paper, and on to it trace the area whose size is required. Now count every whole square (21 in this case); then count every part square (23), and call this 23 halves. The total then is: 21 plus $11\frac{1}{2}$ $=32\frac{1}{2}$ squares=32·5 sq. chains =3·25 acres.

Using this method, find the area of the district between the southern side of Brammal Lane and the southern edge of the map, Fig. 3.

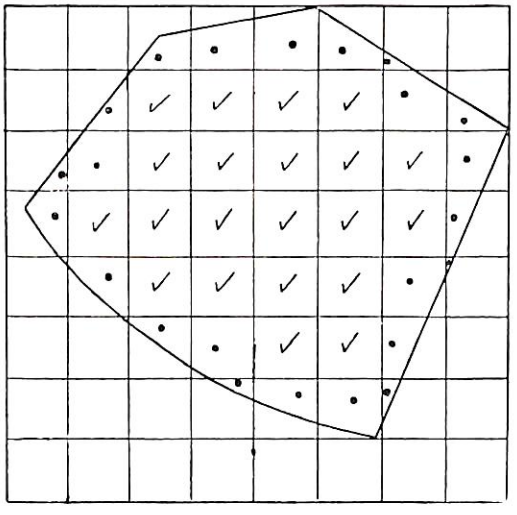


FIG. 5

# ONE INCH (1:63,360) MAPS, SEVENTH SERIES

**Roads**
- Ministry of Transport, Motorway — M 1
- " " " Trunk } Single & Dual — A 31 (T)
- " " " Class 1 } Carriageway — A 35
- " " " " 2 — B 3074
- 14 ft of Metalling & over (not included above)
- Under 14ft of Metalling, Tarred " " — TOLL
- " " " " Untarred " " — Gate
- Minor Roads in towns, Drives and Unmetalled Roads (Unfenced Roads are shown by pecked lines)
- Under construction

Steep Gradient 1 in 5 or steeper — 1 in 7 to under 1 in 5
Footpaths and Tracks
Heights in feet above Mean Sea Level — surveyed by levelling ·275; not surveyed by levelling ·1091
Triangulation Station △
Intersection, Lat & Long at 5' intervals (not shown where it confuses important detail)

Church or Chapel with Tower
" " " " Spire
" " " without either
Wireless or TV Mast
Windpump
Windmills (in use) (disused)
Lighthouse — Lightship
Public House PH — Post Office P
Mile Stone MS
Mile Post MP
Telephone Call Box: PO T; AA A; RAC R
Town Hall TH
Club House CH
Roman Antiquities (AD 43 to AD 420) VILLA
Other Antiquities Tumulus, Castle
Site of Antiquity +
Site of Battle (with date) 1066

**Railways**
- Multiple Track — Principal Station; Bridge over; Tunnel; Cutting; Footbridge
- Single " — Viaduct; Station; Station (closed); Embankment; Level Crossing; Bridge under
- Narrow Gauge — Mineral Line, Sidings & Tramway

Wood
Orchard
Electricity Transmission Line (with pylons spaced conventionally)
Pipe Line — Arrow indicates direction of flow
Marsh
Rough Pasture
Boundaries, National
County — Parish
County with Parish, Co Boro

Bus & Coach Station
Parks and Ornamental Grounds
Glasshouses
Quarry
Open Pit
Contours at 50 ft intervals — 250

Youth Hostel
National Trust (always open) NT
" " (opening restricted) NT
Highest point to which Tides flow
Canal; Aqueduct; Lock; Ford; Ferry; Lake; Weir; Bridge; Ferry For Vehicles [V] For Foot Passengers [F]; Footbridge
Cliffs; Sand Hills; Flat Rocks; Beacon; LWM; Sand & Mud; HWM
Submarine Contours in Fathoms — 5

# 2½ INCH (1:25,000) MAPS

Roads, Ministry of Transport Class I — A 123 — Fenced; Unfenced
" " " " " II — B 2314 — Fenced; Unfenced
Other Roads — Good, metalled; Poor, or unmetalled
Footpaths — FP Fenced; FP Unfenced
Railways, Multiple Track — Station; Bridge over; Sidings; Cutting; Tunnel; FB (Footbridge)
" Single Track — Viaduct; Level Crossing; Embankment; Bridge under
" Narrow Gauge
L P T B & Glasgow District Subway Stations ○ — Interchange Stations ⊗
Aerial Ropeway — Aerial Ropeway

Boundaries
- County or County Borough
- " " County or City (in Scotland)
- " " " " " with Parish
- " Parish

Pipe Line (Oil, Water) — Pipe Line
Electricity Transmission Lines (Pylons shown at bends and spaced conventionally)
Post Offices (In Villages & Rural Areas only) P
Church or Chapel with Tower — Church or Chapel with Spire — Church or Chapel without either +

Trigonometrical Station △ — Trig Sta on Church with Spire — without Spire
Trig Sta on Chimney — Trig Sta on Building
Guide Post GP · Mile Post MP · Mile Stone MS · Boundary Stone BS ○ · Boundary Post BP ○
Youth Hostel Y — Telephone Kiosk (Public) T (AA) A (RAC) R — Antiquity (Site of)

Public Buildings
Quarry & Gravel Pit
National Trust Area — Sheen Common NT
Osier Bed
Reeds
Park, Fenced
Wood, Coniferous, Fenced
Wood, Deciduous, Unfenced
Brushwood, Fenced & Unfenced
Glasshouses
Orchard
Furze
Rough Pasture, Heath & Moor
Marsh
Well W°
Spot Height 123·



Conventional Signs used on 1" and 2½" Ordnance Survey Maps

Printed in Great Britain by W. & A. K. Johnston & G. W. Bacon Ltd., London & Edinburgh.

## SYMBOLS USED ON ORDNANCE SURVEY MAPS

The shorthand of maps is very easy to read and use because most of the symbols used explain themselves, as you will see by studying the sheet on the opposite page and the map and picture overleaf.

The following notes will help you to understand the symbols more fully and to learn them more easily.

**Fenced roads** are roads which are separated in any way from the surrounding land; the 'fence' may be a wall, a hedge, a line of railings, or a line of buildings. Where an unfenced road is marked on the map you may be almost certain that the land is moor, or common, or rough pasture which is not worth cultivating. **Bridle roads** are usable by horses as well as by foot passengers. The bridle road, therefore, should have gates instead of stiles.

**Railways.** It is rather difficult to remember which symbol is used for multiple track and which for single track, especially as the single track lines on the 1-inch map are very like the double track lines on the $2\frac{1}{2}$-inch map; but a useful general rule is: 'More black, more track.' **Cuttings and embankments** look somewhat alike at first; but notice that in each case the thick part of the stroke is at the top of the slope, so that in a cutting the heavier shading is on the outside of the symbol, while in the embankment the heaviest part is on the inside.

**Narrow gauge railways,** with a track width of less than 4 ft. $8\frac{1}{2}$ in., are often built to serve collieries, quarries, and reservoirs, etc., in course of construction.

**Bridges.** Note that the sides of the bridge are drawn parallel to the feature that goes **over** another, as the bridge would appear as seen from above. In a level crossing both road and railway are shown. A viaduct is a specially long bridge. An aqueduct is a bridge which carries a canal or other waterway.

**Churches.** A church without tower or spire is shown by a cross, a church with a tower by a square surmounted by a cross, and a church with a spire by a circle surmounted by a cross.

A **trigonometrical station,** shown by a triangle, is a point where the surveyors placed their instruments when surveying the surrounding country. **Bench marks,** shown by a broad arrow, indicate points whose heights have been very accurately found. You may find these broad arrows chiselled on walls, or on metal plates set in concrete columns. **Spot heights** are points whose height has been found to the nearest foot.

**Trees.** The symbols for these are diagrammatic: 'Christmas trees' for coniferous trees such as pine, fir, and larch; and rounded 'trees' for deciduous trees such as oak, ash, elm, beech, birch, etc. Brushwood is shown by small rounded 'trees'; rough pasture by very small dashes in arch form, and furze by rather thicker dashes in more humped arches. The symbols for marsh, reeds, and osier beds explain themselves. (Osiers are long, pliable shoots of willow, used in basket-making.) It is interesting to note that the symbols mentioned in this paragraph are among the few that are shown in elevation instead of in plan. Can you find other symbols which are shown in elevation?

**Parks** are shown by close diagonal lines of dots, **orchards** by more widely spaced vertical and horizontal lines of dots.

The **National Trust** is a body which looks after beautiful and historic places which have been given to it by the owners. Note the differing symbols of the 1-in. and the $2\frac{1}{2}$-in. maps.

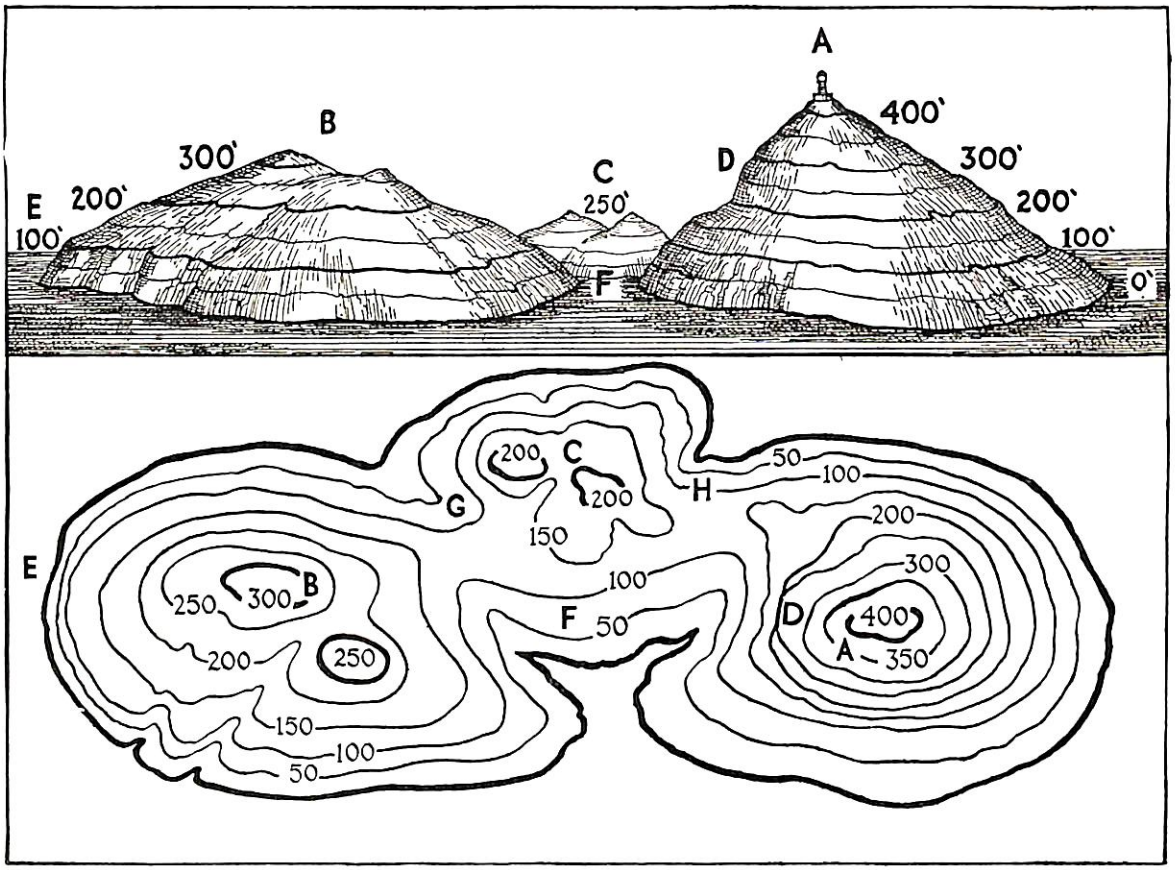
**Features of the sea coast** are illustrated on p. 13. Note especially the symbols for earth-slopes and rocky cliffs, and for foreshores of mud, sand, and flat rocks. Name the symbols of coastal features which are shown in elevation.

L.W.M. stands for low-water mark of tide, H.W.M. for high-water mark. The space between the two is known as the foreshore.

(For practice in reading map symbols compare in detail the 6-inch map and the air mosaic between pages 6 and 7.)

The drawing below shows an island in the Red Sea with lines drawn on it to show where the coast-line would be if the land sank first 50 ft., then 100 ft., and so on.

Fig. 7 shows these coast-lines as they would appear on a map. Such lines are known as **contour lines.**




FIGS. 6 AND 7

Contour lines are the most effective way of showing the relief of the land. They show us at a glance:

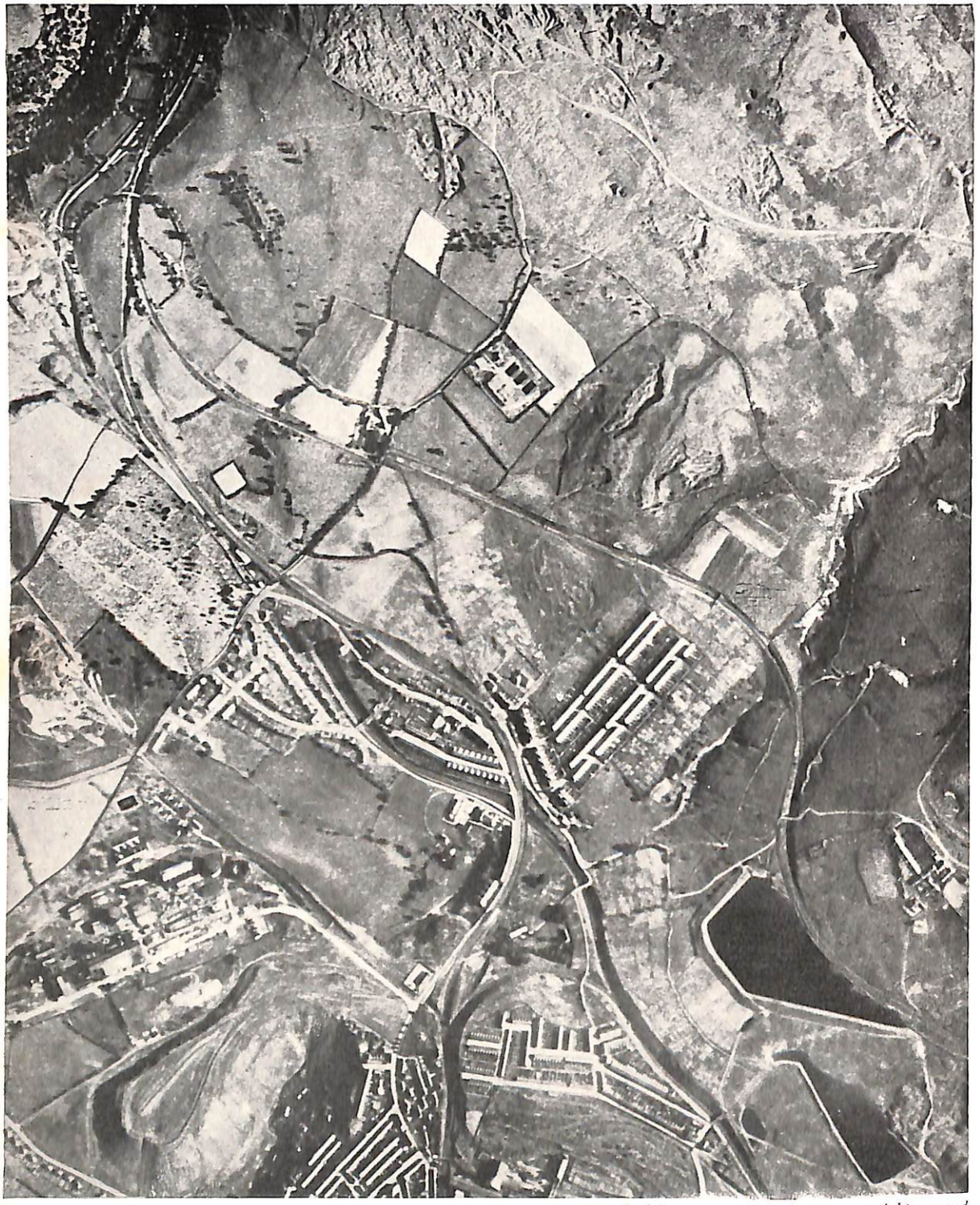
The height of the land; the slope of the land; and the form of the land.

Compare Figs. 6 and 7, and note that:

A is a conical hill over 400 ft. high
B is a steep-sided hill with twin peaks
C is a hollow between two conical hills
D is a steep, cliff-like slope
E is a very steep slope
F is a comparatively gentle slope

With practice you can learn to 'read' a contour map so well that the features of the land stand out as clearly as in a picture or a model; indeed, you can often 'see' more on a contour map than on a picture; for example, on the contour map you can see the two valleys G and H which cannot be shown on the picture.

A modern writer speaks of the joy he experiences when 'the contours sing together'; but before you can read a poem you must know the letters and words. The diagrams on pp. 6 to 13 give the A B C of contour-map reading—the features which appear over and over in different combinations in the relief of the land.





AIR MOSAIC OF PART OF SOUTH WALES

*(Compare with the 6-in. Ordnance Survey map on opposite page)*


*Scale — Six Inches to One Statute Mile or 880 Feet to One Inch = 1/10560*

10 Chains 5 0 10 20 30 40

1000 Feet 500 0 1000 2000

1 Furlong 0 ¼ ½

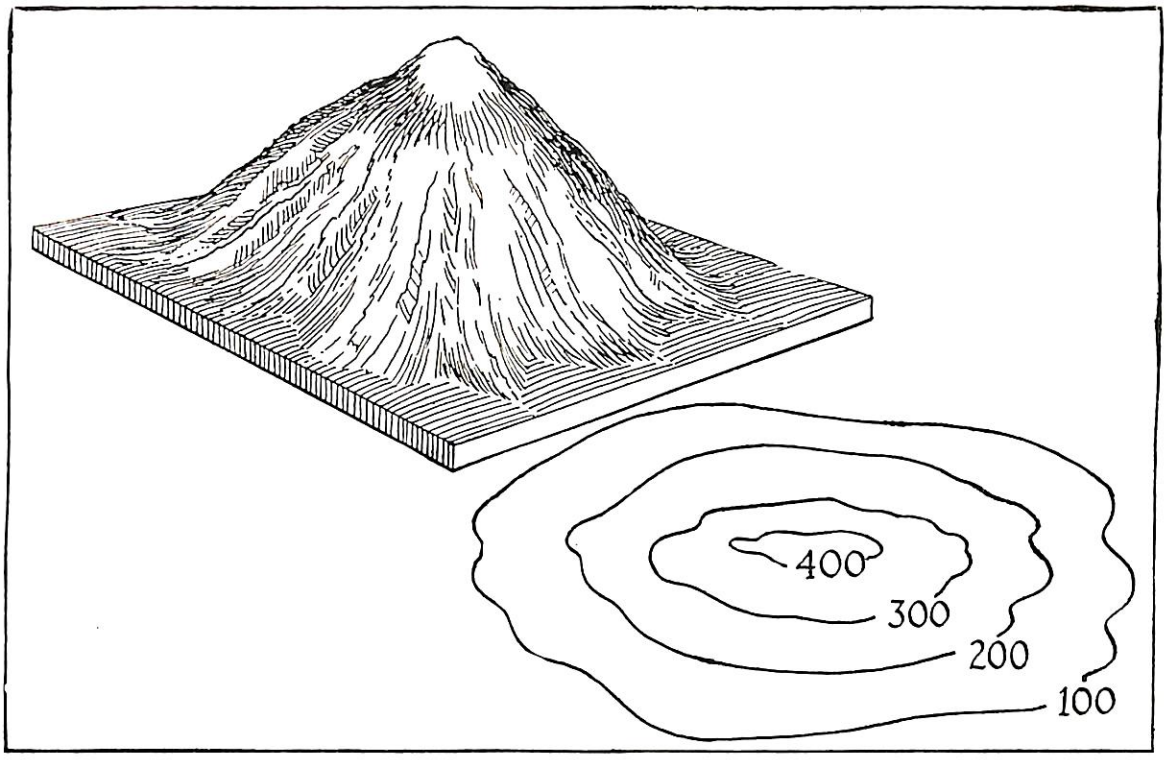



FIG. 8. CONICAL HILL

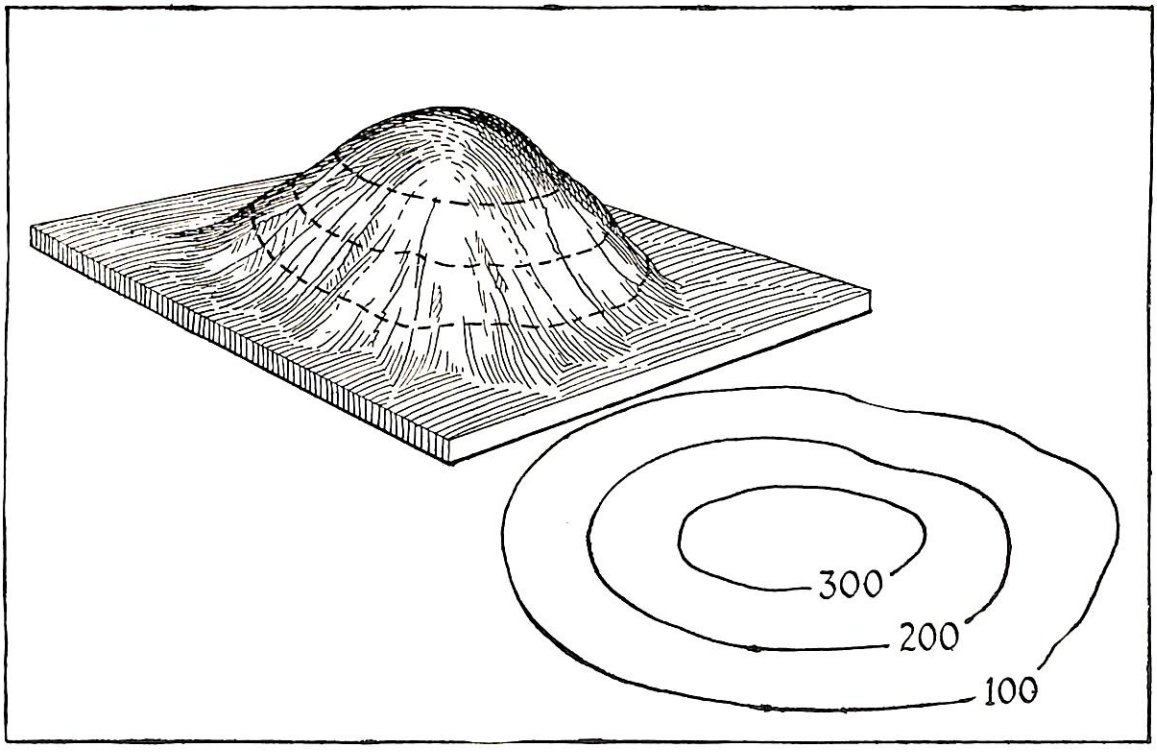



FIG. 9. ROUND-TOPPED HILL

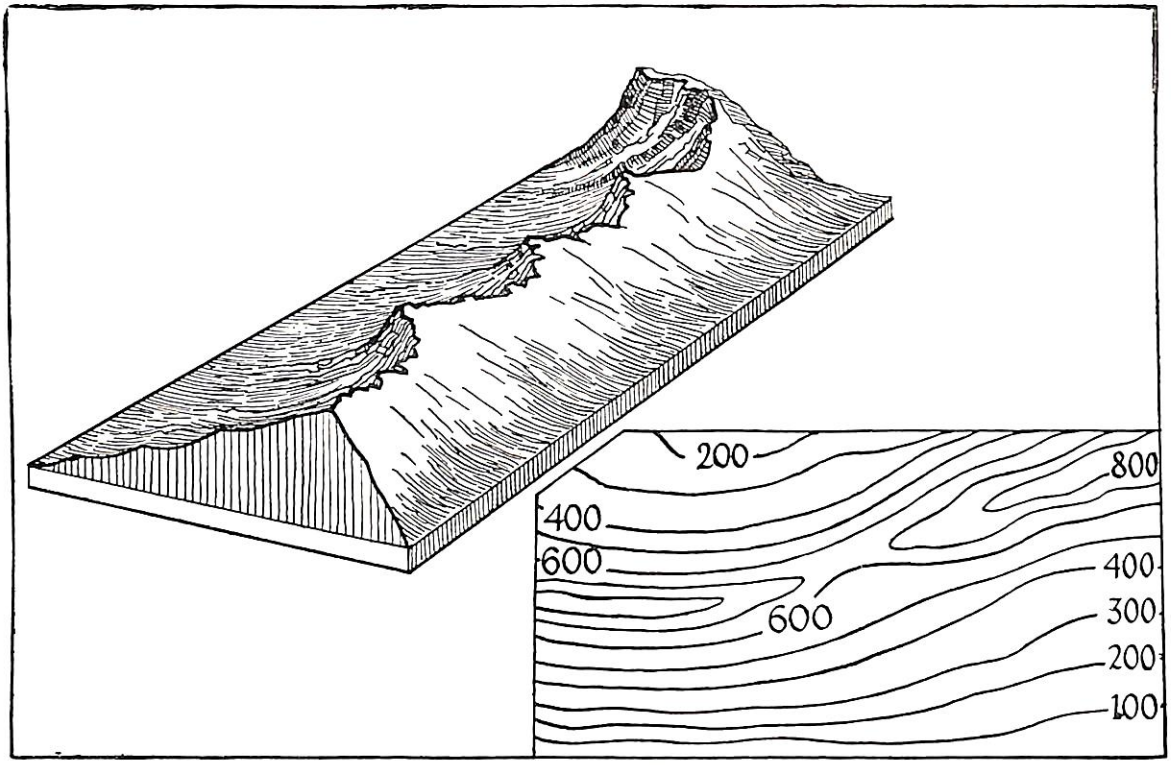



FIG. 10. KNIFE-EDGED RIDGE

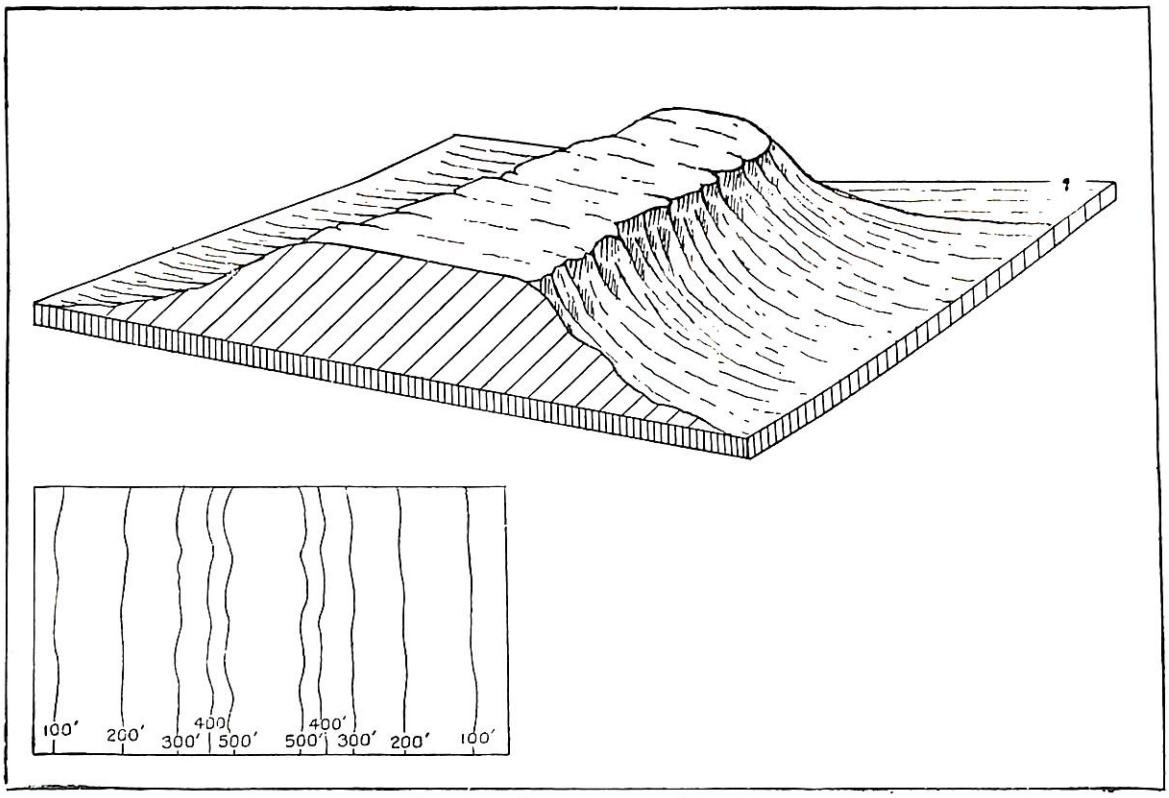



FIG. 11. FLAT-TOPPED RIDGE

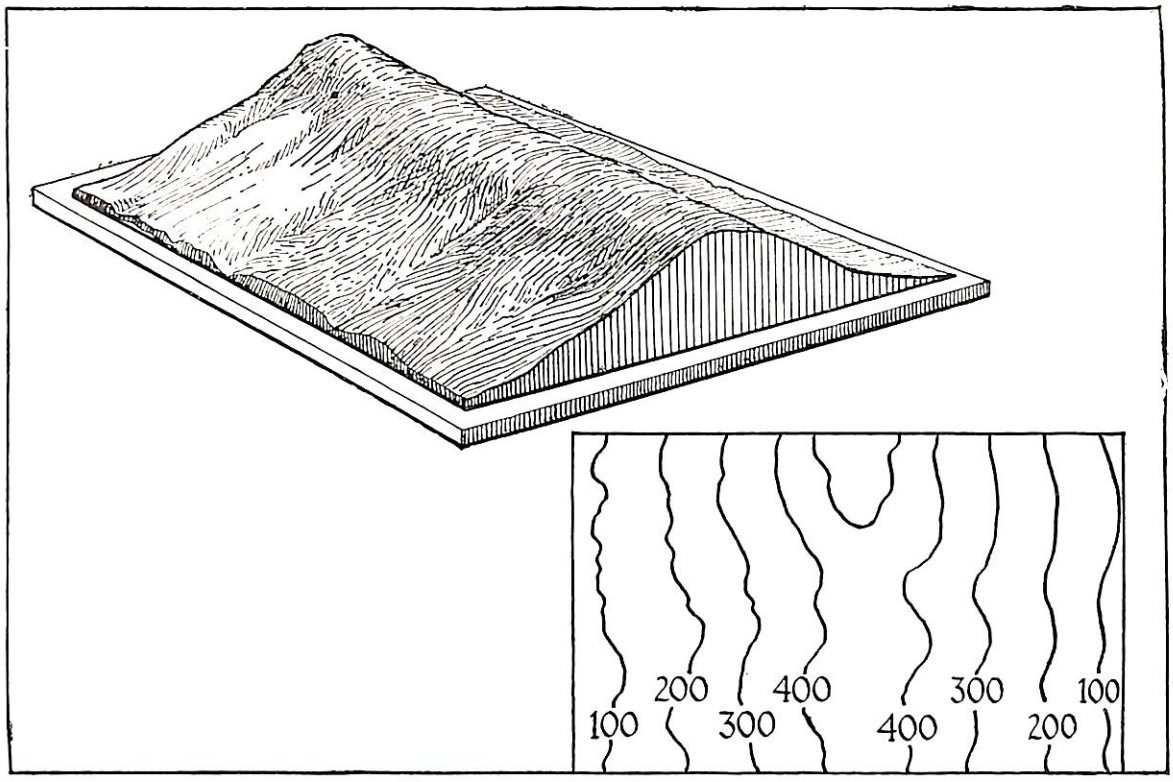



FIG. 12. ROUND-TOPPED RIDGE

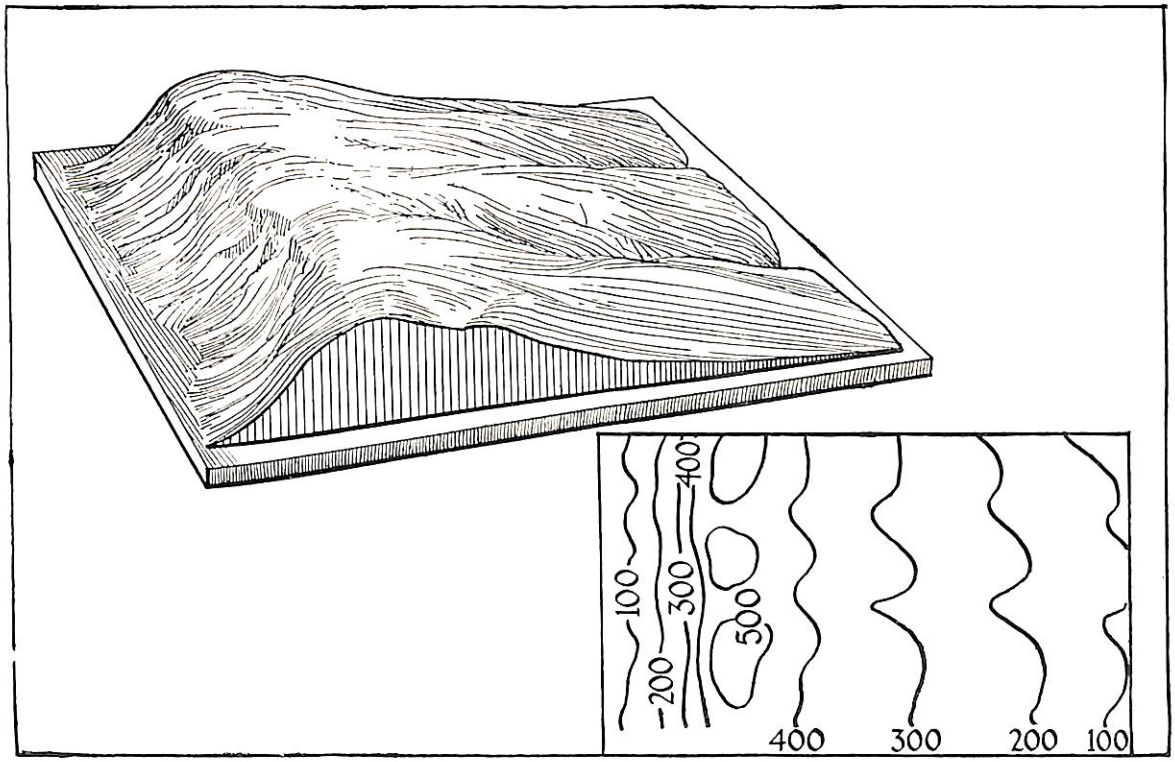



FIG. 13. ESCARPMENT

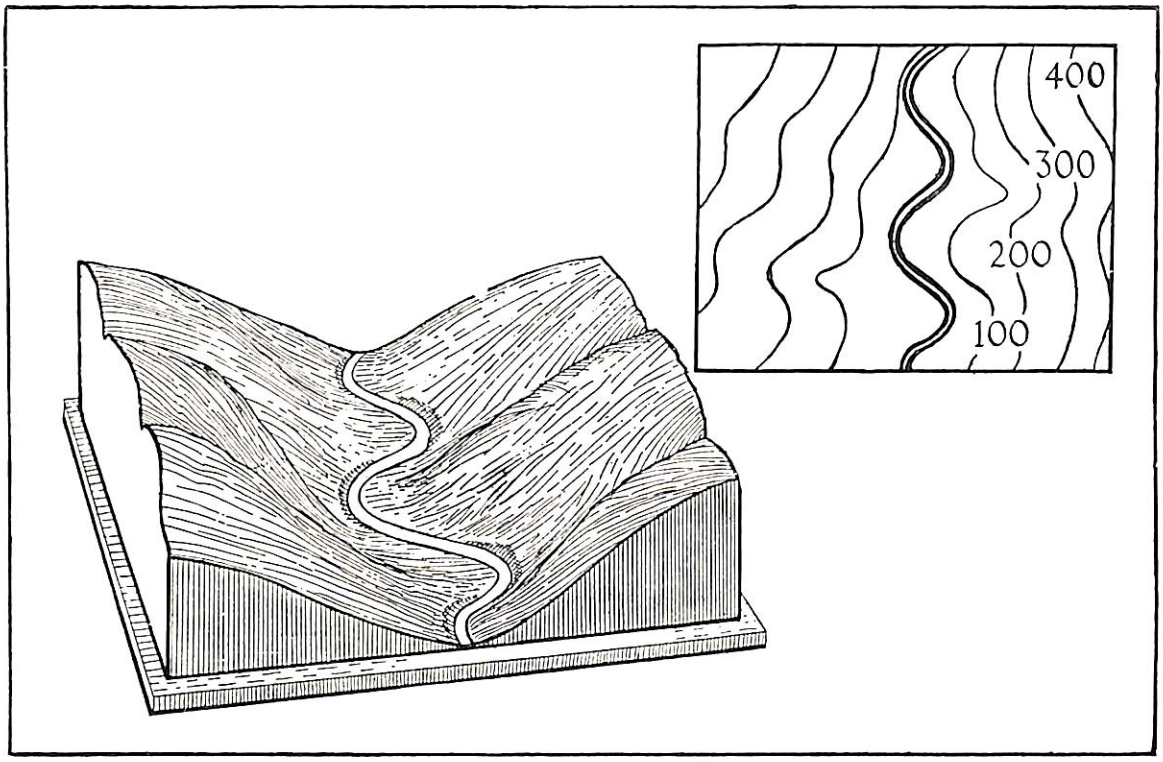



FIG. 14. BROAD VALLEY

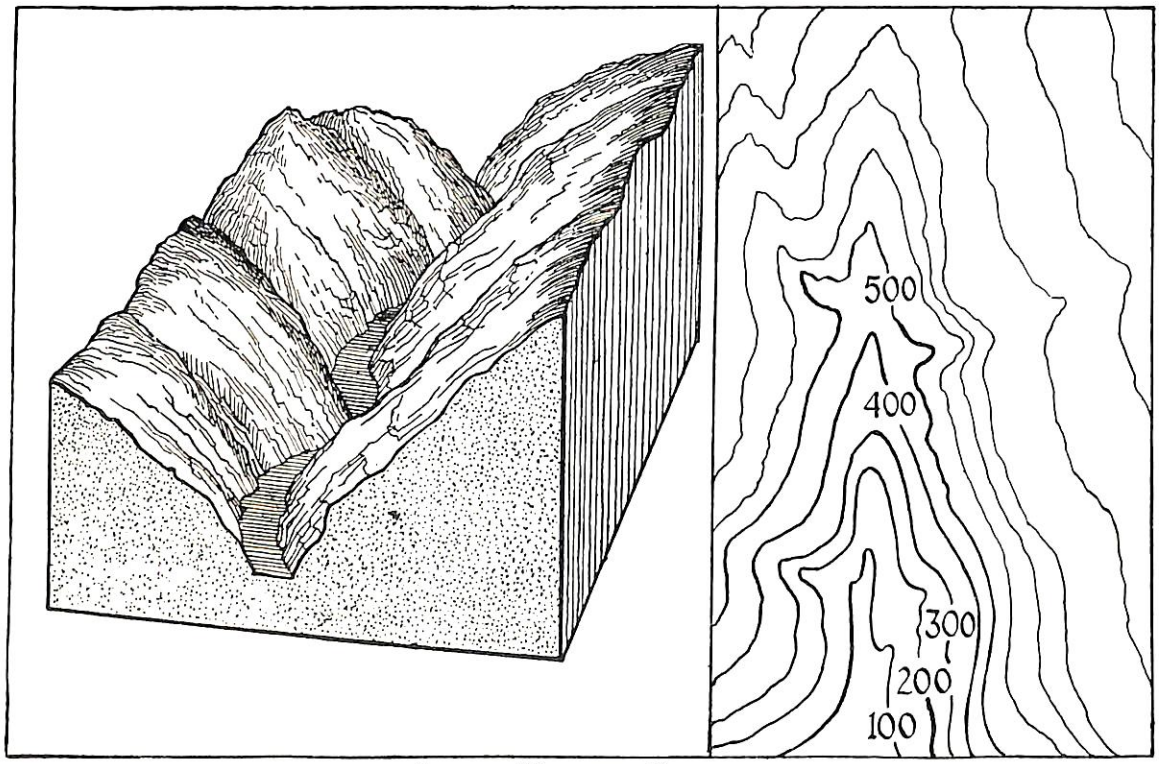



FIG. 15. V-SHAPED VALLEY

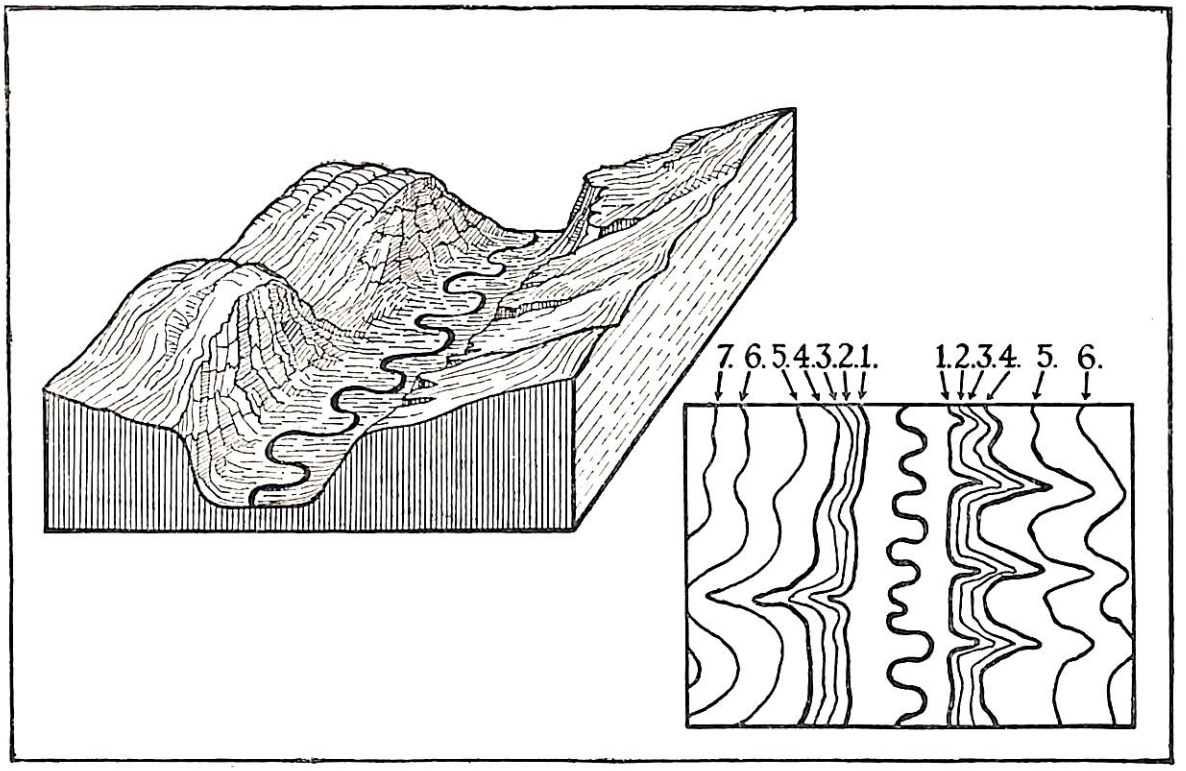



FIG. 16. STEEP-SIDED, FLAT-BOTTOMED, U-SHAPED VALLEY

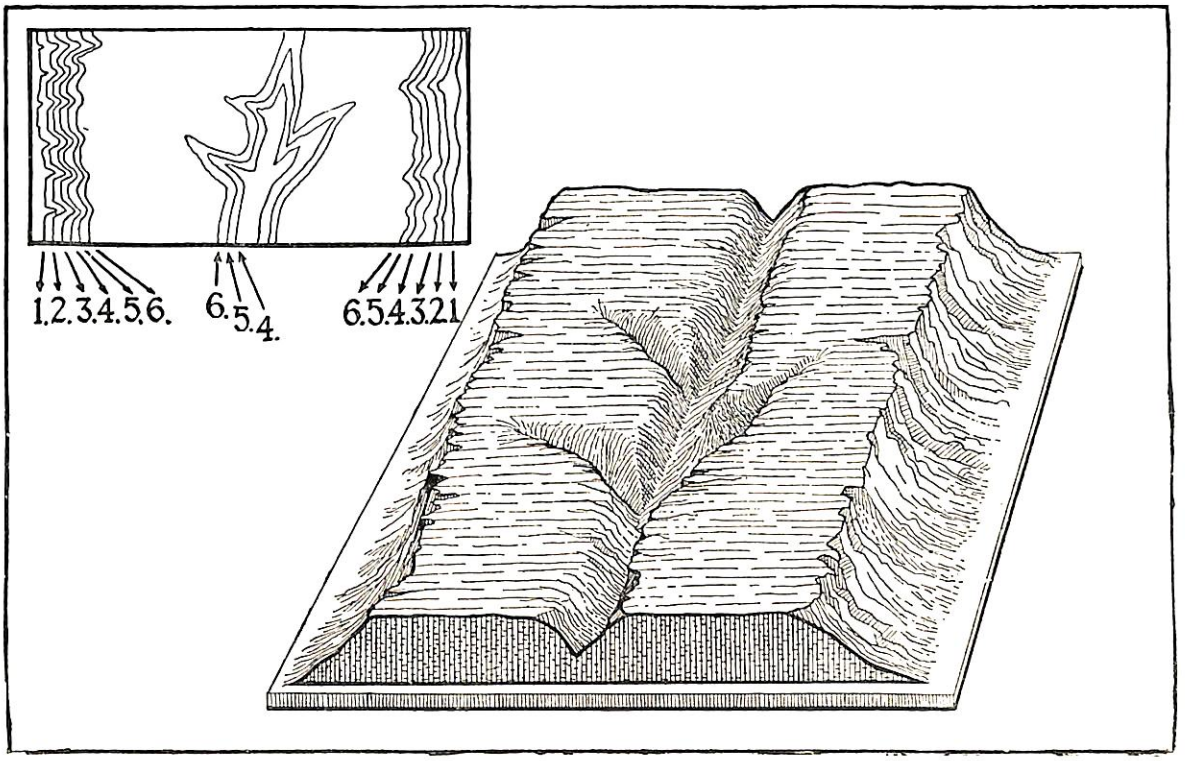



FIG. 17. DISSECTED PLATEAU

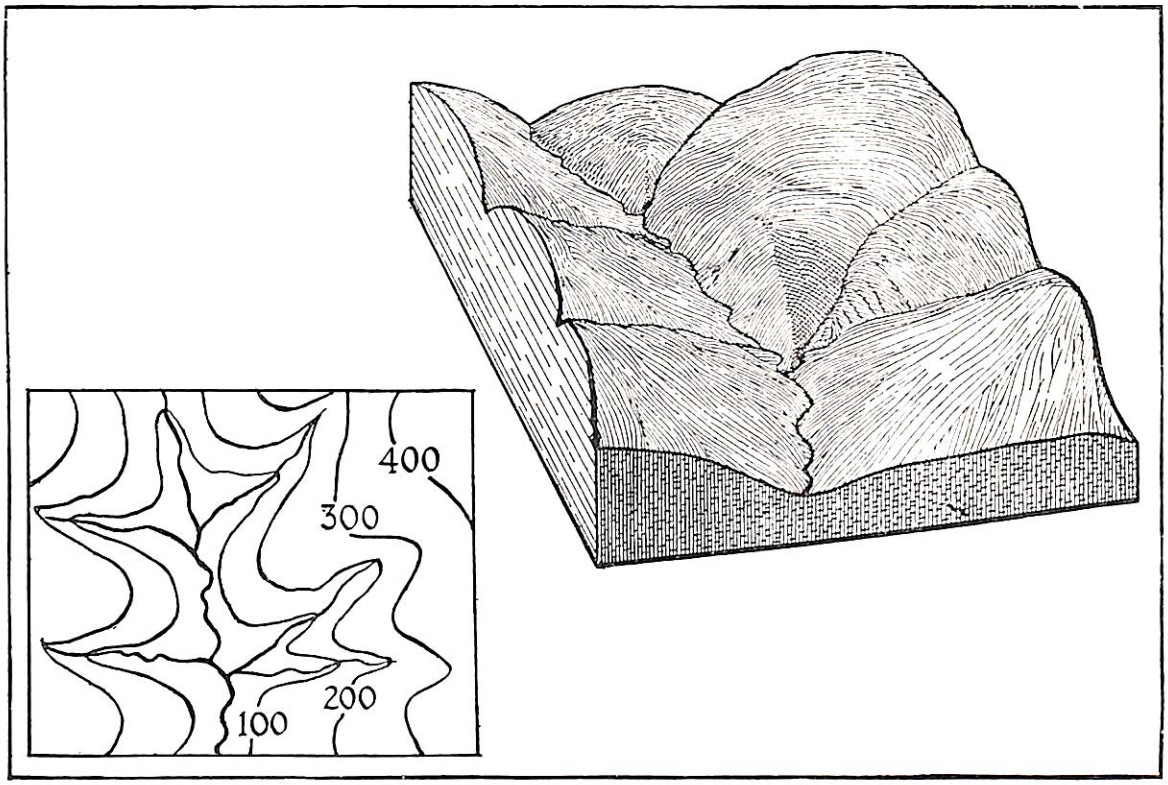



FIG. 18. ROUND-TOPPED HILLS AND DEEP VALLEY

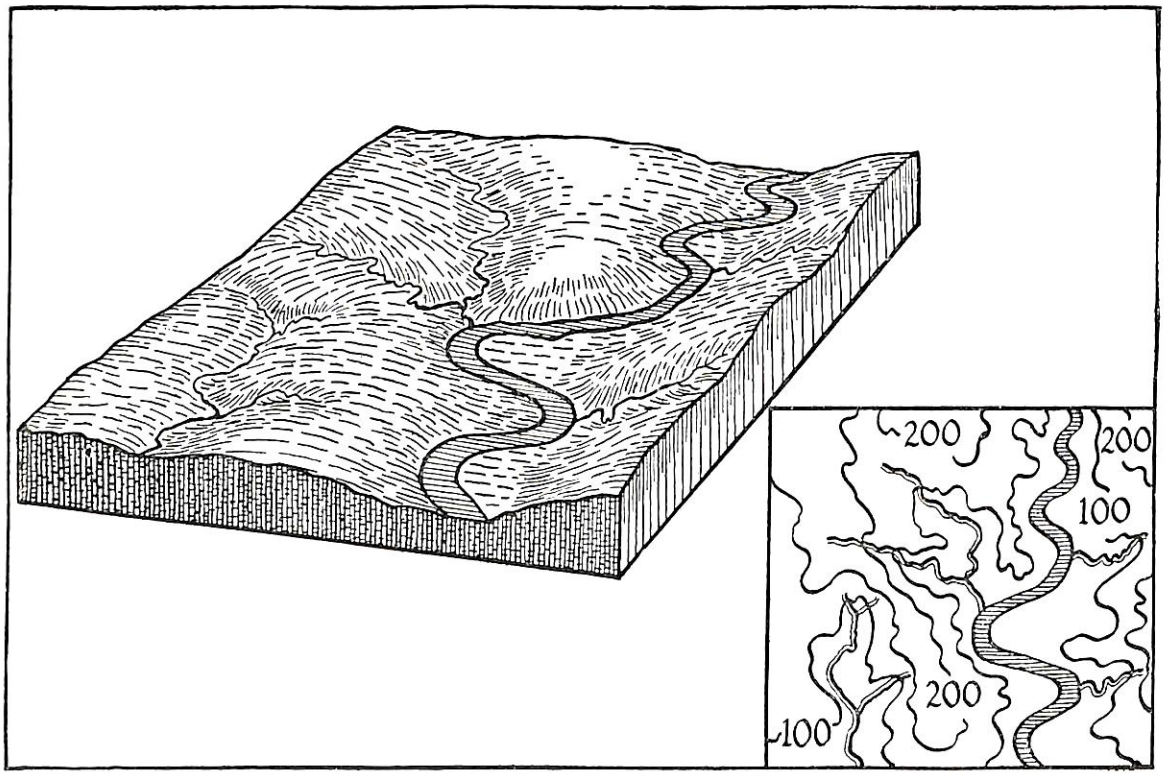



FIG. 19. UNDULATING COUNTRY

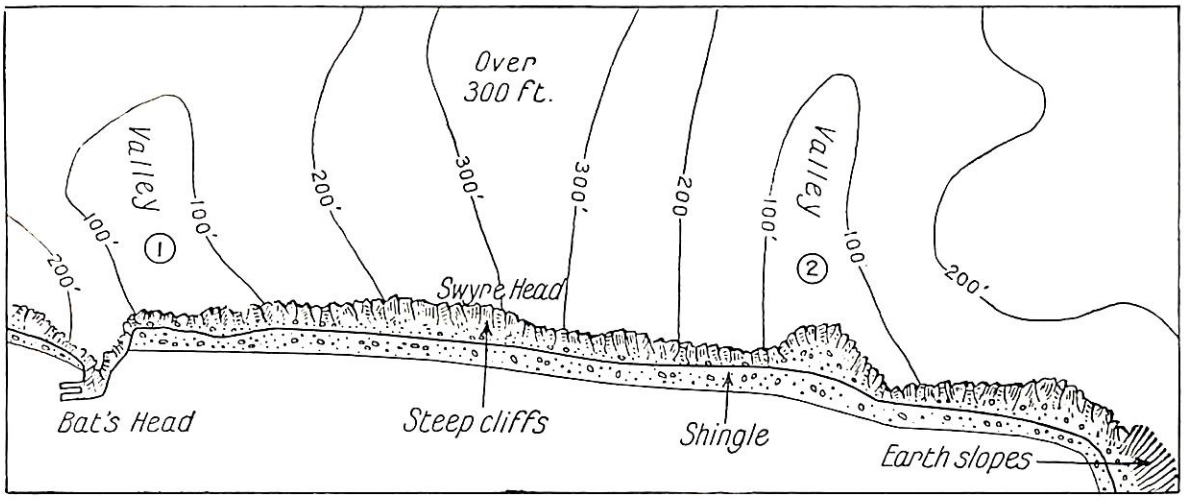



FIG. 20. SKETCH-MAP OF DURDLE BAY

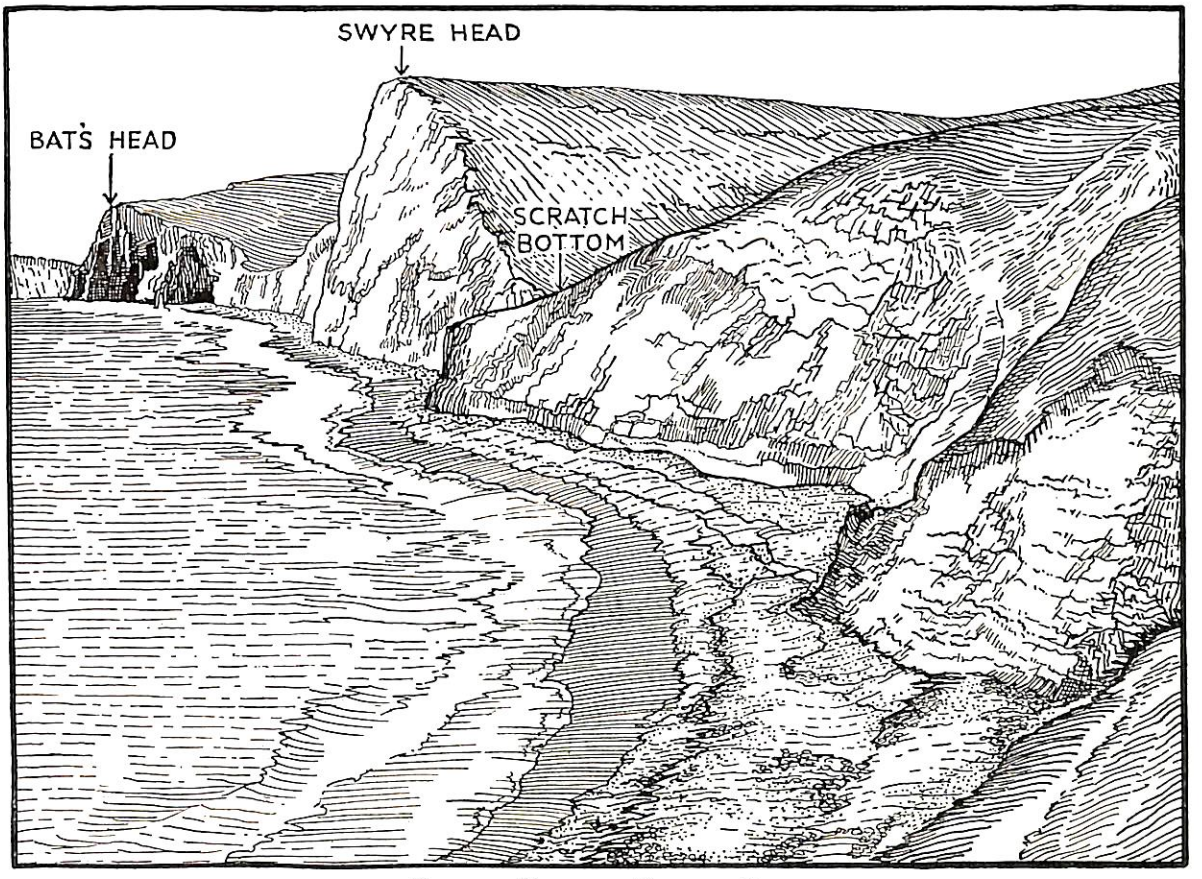



FIG. 21. VIEW OF DURDLE BAY

## FEATURES OF THE SEA COAST

The above sketches show the meaning of some of the symbols used to show the features of the sea coast. Compare in detail the sketch and the map, so that the symbols on the map will in future call pictures of the feature to mind.

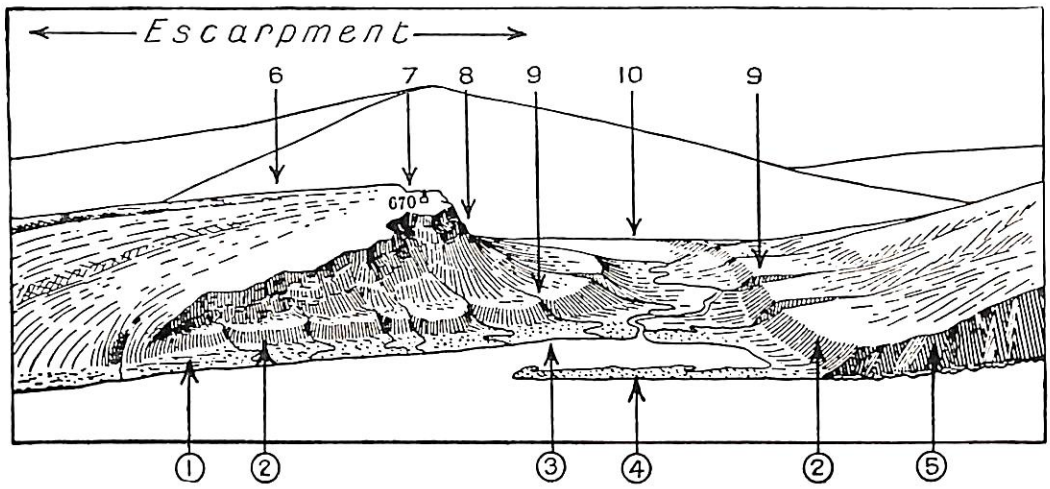



FIG. 22

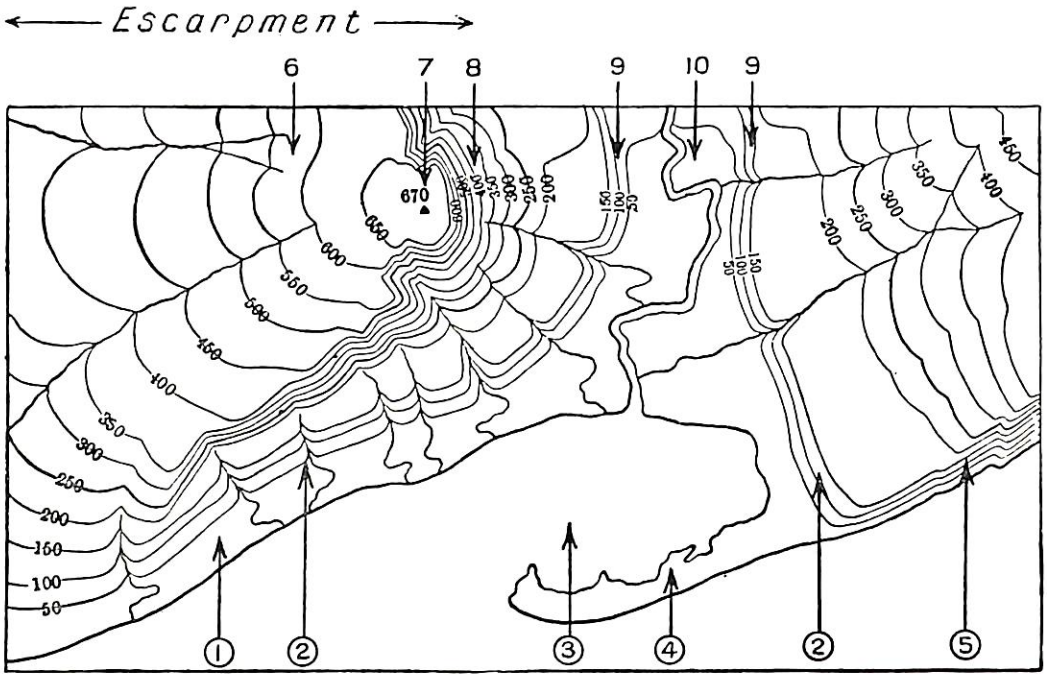



FIG. 23

## KEY TO FEATURES SHOWN ON PICTURE AND MAP

(1) Narrow coastal plain. (2) Bluffs. (3) Lagoon. (4) Sand spit. (5) Sea cliffs. (6) Dip-slope of escarpment. (7) Crest of escarpment. (8) Scarp slope. (9) Tributaries cutting narrow valleys through the bluffs. (10) Flood-plain with meandering river.

TEST MAP

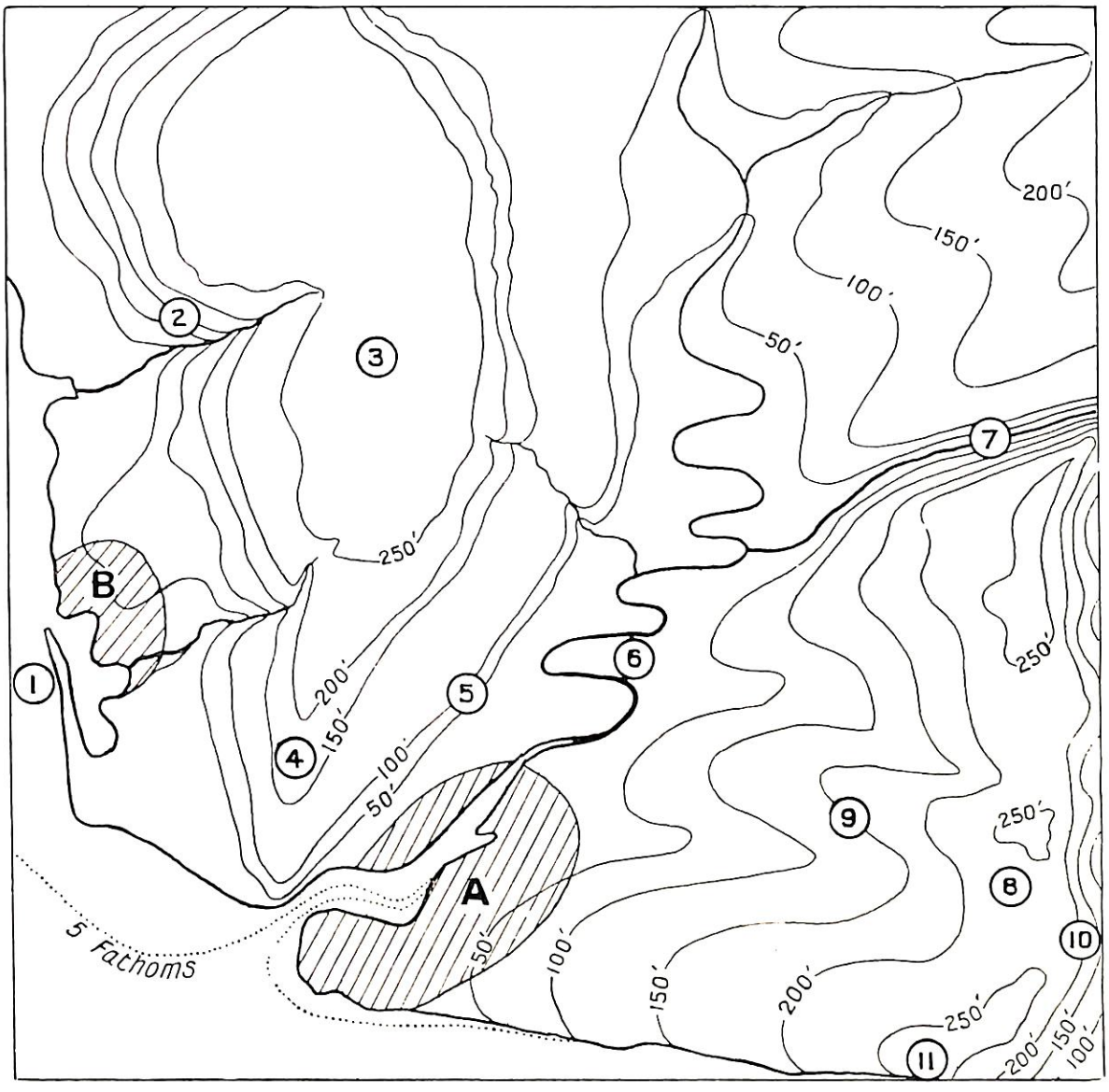



FIG. 24

(1) The numbers on the above map correspond to the following features, though not in that order; list the features with their correct numbers. Broad, flat-bottomed valley; plateau; crest of escarpment; sand spit; deep, narrow, steep-sided, V-shaped valley; a river which flows fastest in its middle course; bluff, or stepped slope; dip-slope of an escarpment; vertical cliffs; scarp slope; steep-sided spur.

(2) Give lists of factors which favoured the rise of (*a*) the large town A; (*b*) the fishing port and holiday resort B.

TEST MAP

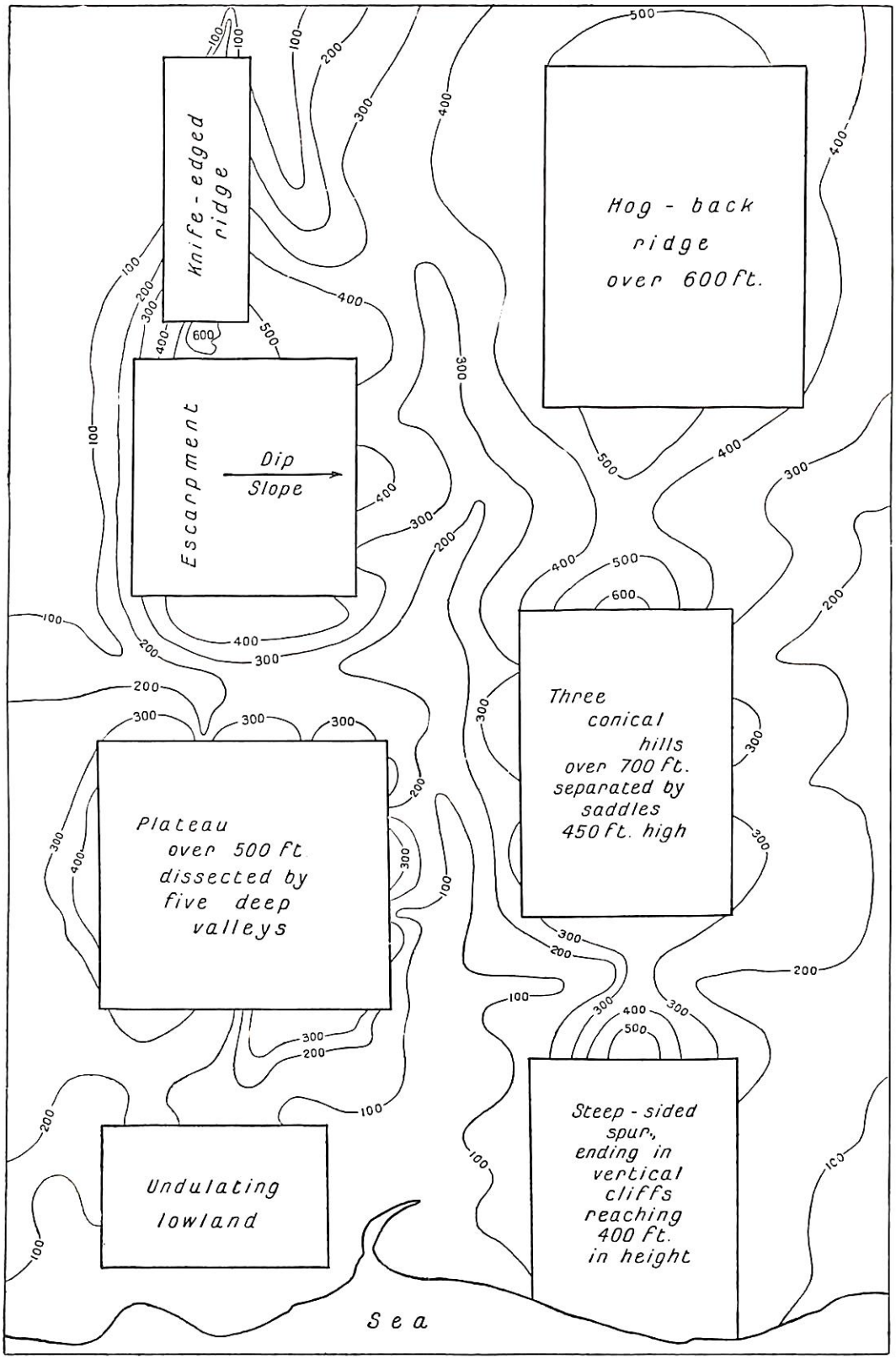



FIG. 25. Complete the above contour map to show the features named in the rectangles.

## HOW STEEP IS THE SLOPE?

Suppose two boys have an argument as to whose street is the steeper: how could they settle the dispute? They might try cycling up both streets, or seeing how fast a ball would roll down the gutters, or how quickly they could slide down; but neither would readily agree that the other boy's claim was right. The only way to decide is to **measure** the gradient.

Gradients are usually expressed as a fraction. If you walk the plank shown in Fig. 26 you will rise a height of one brick as you go a horizontal distance of nine bricks; the gradient of the plank is, therefore, said to be one in nine. (Note that a gradient of 1 in 10 is **less** than a gradient of 1 in 9.)

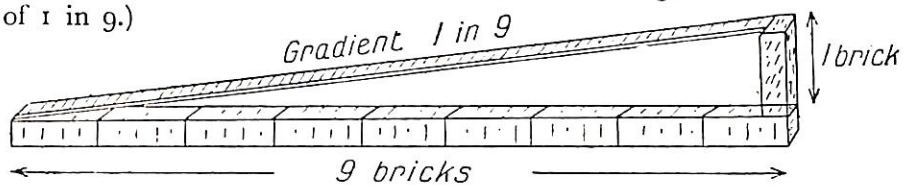



Fig. 26

In Fig. 27 the distance XY is 150 ft.; the rise from X to Y is 20 ft.; hence the gradient is 20 ft. in 150 ft., i.e. 1 in $7\frac{1}{2}$. Find the gradient between A and B in Fig. 27.

*Formula:* Gradient $= \dfrac{\text{Rise}}{\text{Horizontal distance}}$.

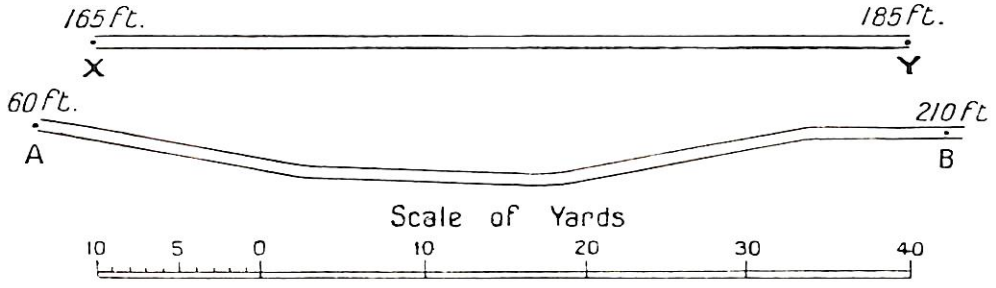



Fig. 27

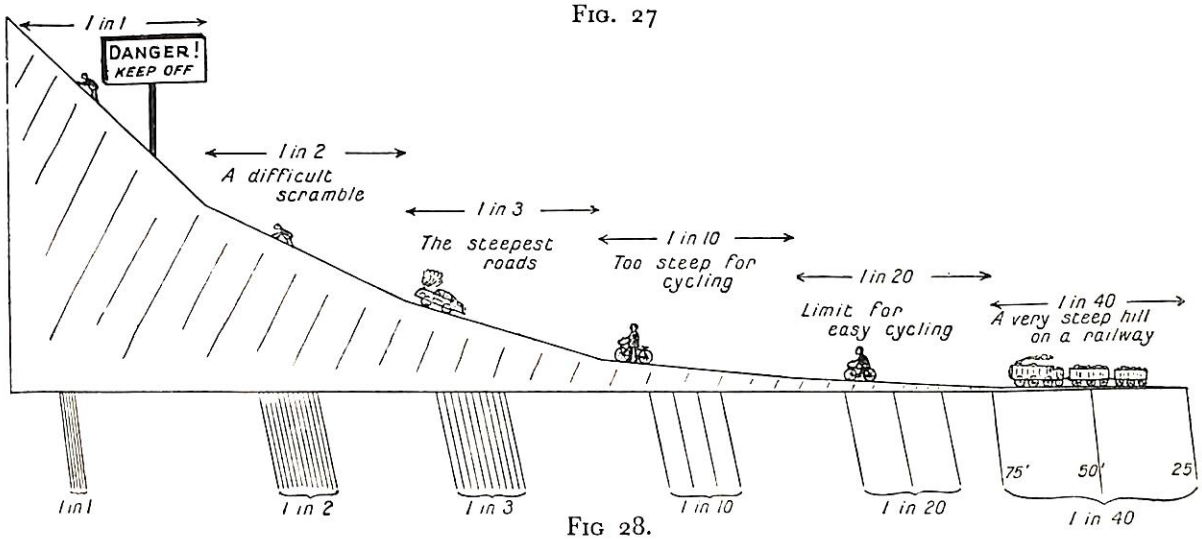



Fig 28.

Fig. 28 shows some interesting gradients, with the spacing of the contours as they are on the $2\frac{1}{2}$-in.-to-the-mile map. With practice you can learn to spot these gradients on the map quite quickly, and so see at a glance which roads are too steep for cycling, which hillsides are too steep for climbing, etc.

## SECTION DRAWING

The diagrams on the opposite page make clear the process of drawing a section across a contour map, as along the line AB in Fig. 30 (*a*).

(1) Prepare a vertical scale, as shown in Fig. 30 (*c*)—squared paper will be a convenience for this. Take care not to make the vertical scale too high, otherwise the slopes will look unnaturally steep. If the scale of the map is $2\frac{1}{2}$ in. to the mile a vertical scale of one-tenth of an inch for 25 ft. will be the maximum you should use.

(2) Place a straight edge of paper along the line of section as shown in Fig. 30 (*b*). On this mark the point where each contour crosses the section line, with the height of the contour. It is convenient to use a narrow strip of paper, so that numbers on the contours can be seen both above and below the strip.

Where the section line crosses the same contour twice, as at *a*, *b*, *c*, *d*, and *e*, make a little hill or valley, showing whether the land goes up or down between the two points.

(3) Transfer the strip of paper to the bottom of the scale, as in Fig. 30 (*c*), and mark off the heights.

(4) Run up each point to its required height as in Fig. 30 (*d*), and join up these points to complete the section.

Note that at *a* the land does not go up to the 500-ft. line, at *b* it does not go down to the 200-ft. line, and so on.

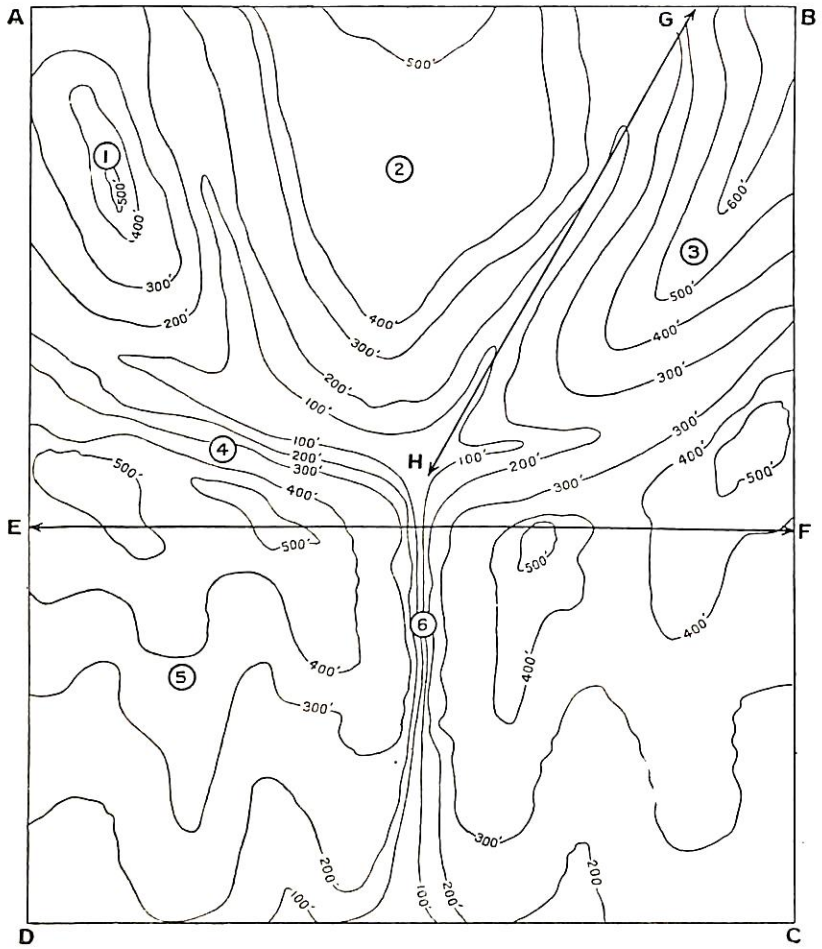



FIG. 29

### EXERCISES

Draw sections along the lines AB, BC, CD, DA, EF, GH in the map, Fig. 29, using the vertical scale given in Fig. 30 (*d*).

The physical features numbered 1 to 6 are a scarp slope; a gorge; a plateau; a V-shaped spur; a dip-slope; a steep-sided, sharp-edged ridge—but not in that order. Say which is which.

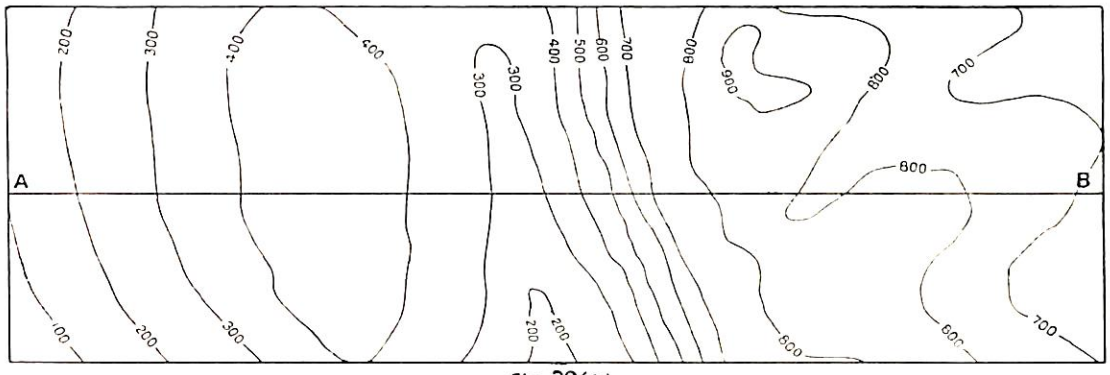



Fig. 30(a)

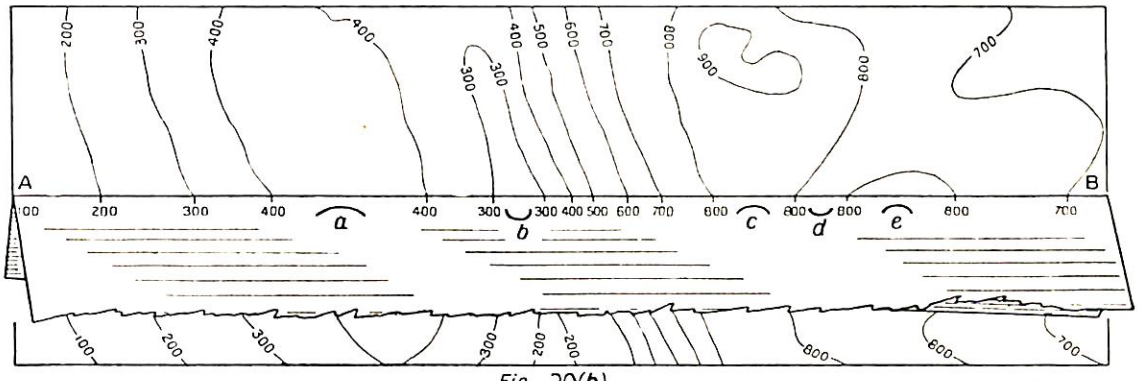



Fig. 30(b)

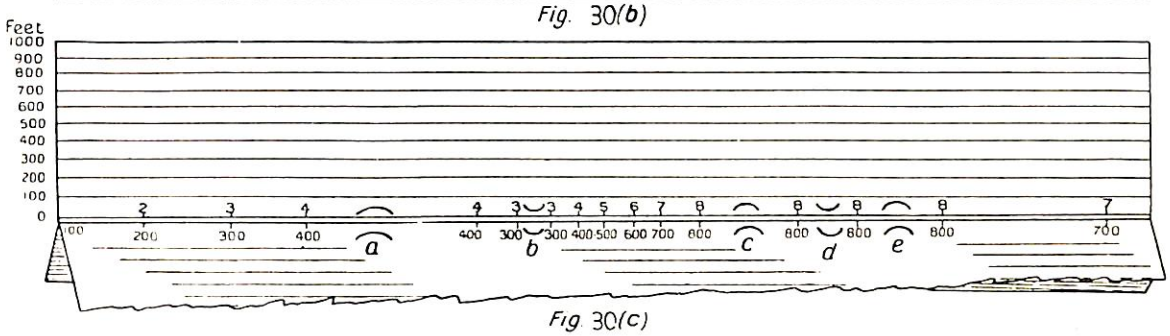



Fig. 30(c)

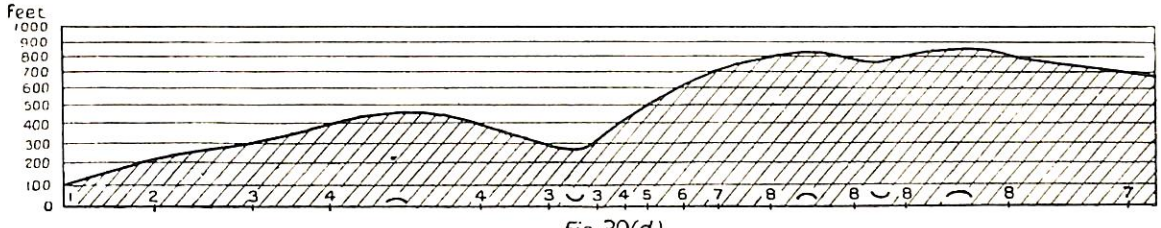



Fig. 30(d)

## SKETCH SECTIONS

Though it is often necessary to draw accurate cross sections, it is for many purposes even more important to be able to draw sketch sections by eye. With a little practice you will soon be able to draw these quickly and with reasonable accuracy.

For example, if you wish to draw a sketch section along the margin AB of the map below, first decide on a rough scale of heights, then fix by eye the positions of the highest and lowest points, and any particularly steep slopes, as shown in Fig. 31 A. Now, with one eye on the map noting the spacing of the contours, complete the cross section as shown in Fig. 31 B.

In a similar way draw sketch sections from C to D and from E to F.

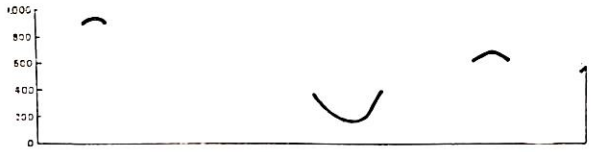


FIG. 31 A

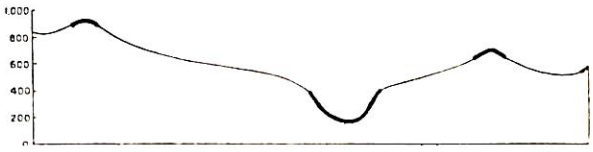


FIG. 31 B

Such sketch sections are especially useful in describing a part of a map, or in comparing one part with another. If, for example, you were asked to compare the valley of the river X with the valley of the river Y, Fig. 32, it would almost be sufficient if you could say: 'In cross section valley X is like this .....; while valley Y is like this ..... Lengthwise valley X is like this ....., and valley Y is like this .....' (Draw the sketches which would fill in the blanks.)

Of course it would be much better if you were also to repeat in words: 'Valley X is steep-sided, flat-bottomed, and U-shaped; valley Y is V-shaped, with more gently sloping sides. The floor of valley X slopes very gently and evenly downstream; the floor of valley Y has a steeper fall, and is very steep between 600 ft. and 500 ft.'

Sketch sections are the shorthand of map description!

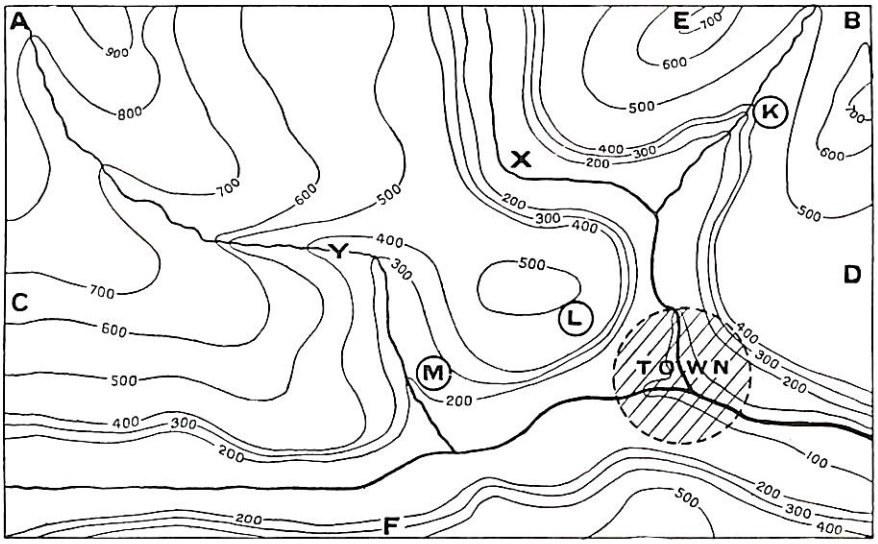



FIG. 32

## EXERCISES

(1) Draw sketch sections to show the positions of villages K, L, and M in relation to the features of the surrounding land.

(2) Draw sketch sections to compare the main west-to-east valley with the valley in which village K lies.

(3) Describe, in words and sketch sections, the position of the town marked on the map.

(4) The gradient between the 200-ft. and-400 ft. contours of the sides of the main north-south valley is one in two. Mark the possible course of good motor roads from the town to villages K and L.

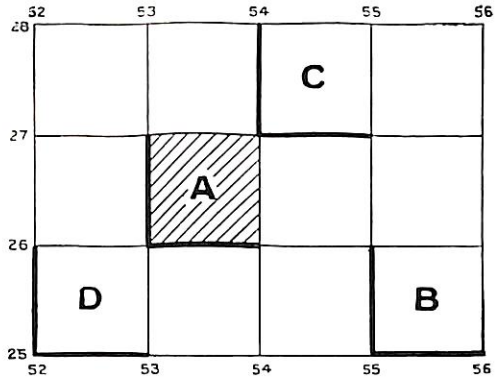



FIG. 33

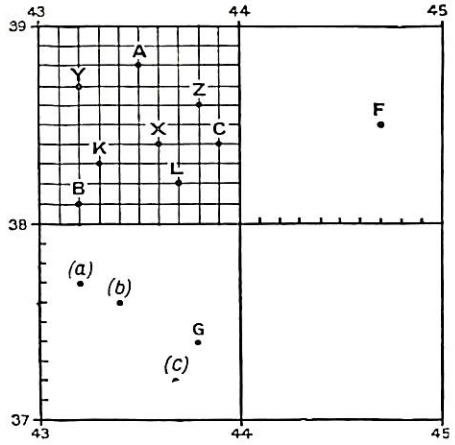



FIG. 34

The National Grid is a system of numbered vertical and horizontal lines 1 kilometre apart. This grid, which gives each square its particular number, is now printed on all Ordnance Survey maps.

Each square is numbered by the lines which form the south-west corner. In Fig. 33 the western edge of square A is formed by the line 53, and the southern edge is formed by line 26, hence the number of the square is 53, 26, usually written without the comma, 5326.

Square B is marked out by the lines 55 and 25, so its number is 5525. Square C is 5427. Square D is 5225, and so on. Note that **the vertical line is always given first.**

This simple system will enable you to refer to the kilometre square in which any particular point lies, and it will then be fairly easy for any one to find a given point within the square. Sometimes, however, it is necessary to state accurately the position of the point within its particular square; this can be done by imagining the side of each square to be divided into tenths, as in square 4338 in Fig. 34.

Point X is six-tenths from the western edge of the square, so its vertical line is 43·6; it is four-tenths from the southern edge of the square, so its horizontal line is 38·4. The position of the point might then be given as 43·6/38·4; in actual practice this is written 436384.

Point Y is 43·2/38·7; which is written 432387. Point Z is 43?38?.

What are the references for points K and L?

Find the points whose references are: 435388; 432381; 439384.

It will generally suffice to **estimate** by eye the position of a point within the square. Thus point F is 447385; point G is 438374. Give the references for points (*a*), (*b*), (*c*). Mark the points M, N, and O, whose references are 445373, 448376, 446379 respectively.

On Ordnance Survey maps Great Britain is divided into squares of 100-kilometre side, as in Fig. 35. On the 1-inch and larger scale maps each of these large squares is divided into squares of 1-kilometer side. So in each of the squares of Fig. 35 we could have a point whose reference is, say, 246648.

Suppose there is a church A in large square TL (52) whose reference is 135642, and that there is another church, B, in large square SU (41) whose reference is also 135642. We could distinguish them by giving the reference of A as TL135642, or 52/135642, and the reference of B as SU135642, or 41/135642.

So we can give a reference for any point in the country which will not be more than 100 metres wrong in any direction, and by using still larger scale maps we can give a reference correct to 10 metres. Can you give your address by numbers only? (Read also page 36.)

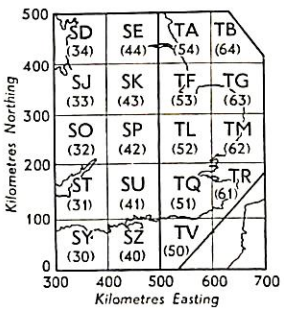



FIG. 35

Of these three forms of transport **canals** need the most level ground. To be economical they must keep on the same level for long distances; consequently they run as nearly parallel to the contours as possible, often winding about a great deal, just as contours do on gently sloping ground. A slight dip in the ground may be crossed by an embankment, and a slight rise by a cutting; stretches of a canal at different levels are connected by locks, which act as steps for the barges.

If you watch a canal barge passing through a lock, you will realize that though locks are often necessary they have several drawbacks—they are expensive to construct and maintain, and they waste a good deal of time, labour, and water. Consequently it pays better to take a canal round all but the slightest ridges, rather than over them.

**Railways** also need fairly level ground, but they can traverse gentle slopes. A gradient of 1 in 100 is a 'hill' on a railway, though you would not notice such a rise if you were cycling or walking.

On a railway journey notice the gradient posts by the side of the track; if the board carries the number 137, for example, that means that the slope is 1 ft. in 137 ft. in the direction in which the arm slopes. Make a note of any steep gradients you see—say, more than 1 in 100, and a very special note of any very steep gradient, such as 1 in 50.

Though a railway between two points needs to be as level as possible, it also needs to be as short as possible; the shortest route may be too steep, and the levellest route may be too long; so the railway engineers generally strike a balance between the two, making the line slant gently across the contours and sometimes making a tunnel to avoid a long detour round a ridge.

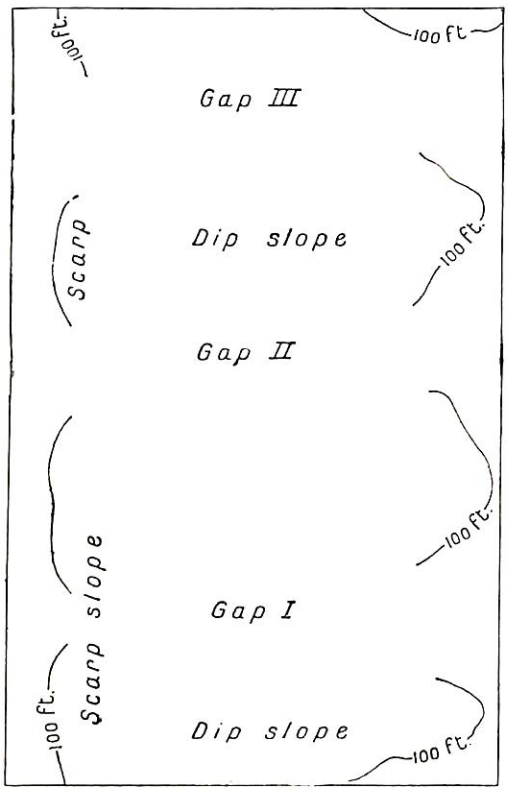



FIG. 36

**Roads** can have a much steeper gradient than railways—most cars, for example, can take a short hill of gradient 1 in 10 in top gear, and can manage a 1-in-3 hill in bottom gear.

Such gradients are fairly common in hilly districts on old roads which were made for horse transport, but modern roads are usually graded to more gentle slopes by slanting them across the contours where this is necessary to avoid steep hills which are an obstruction to motor transport.

Fig. 37 shows road, railway, and canal connecting two towns which are separated by a steep-sided ridge; after studying this complete the contour map in Fig. 36, to show an escarpment with three gaps, one suitable for a road only; another suitable for a road, and a railway with a tunnel; and the third suitable for a road, a railway, and a canal.

Make the crest of the escarpment 500 ft. high, and draw contours at 100-ft. intervals.

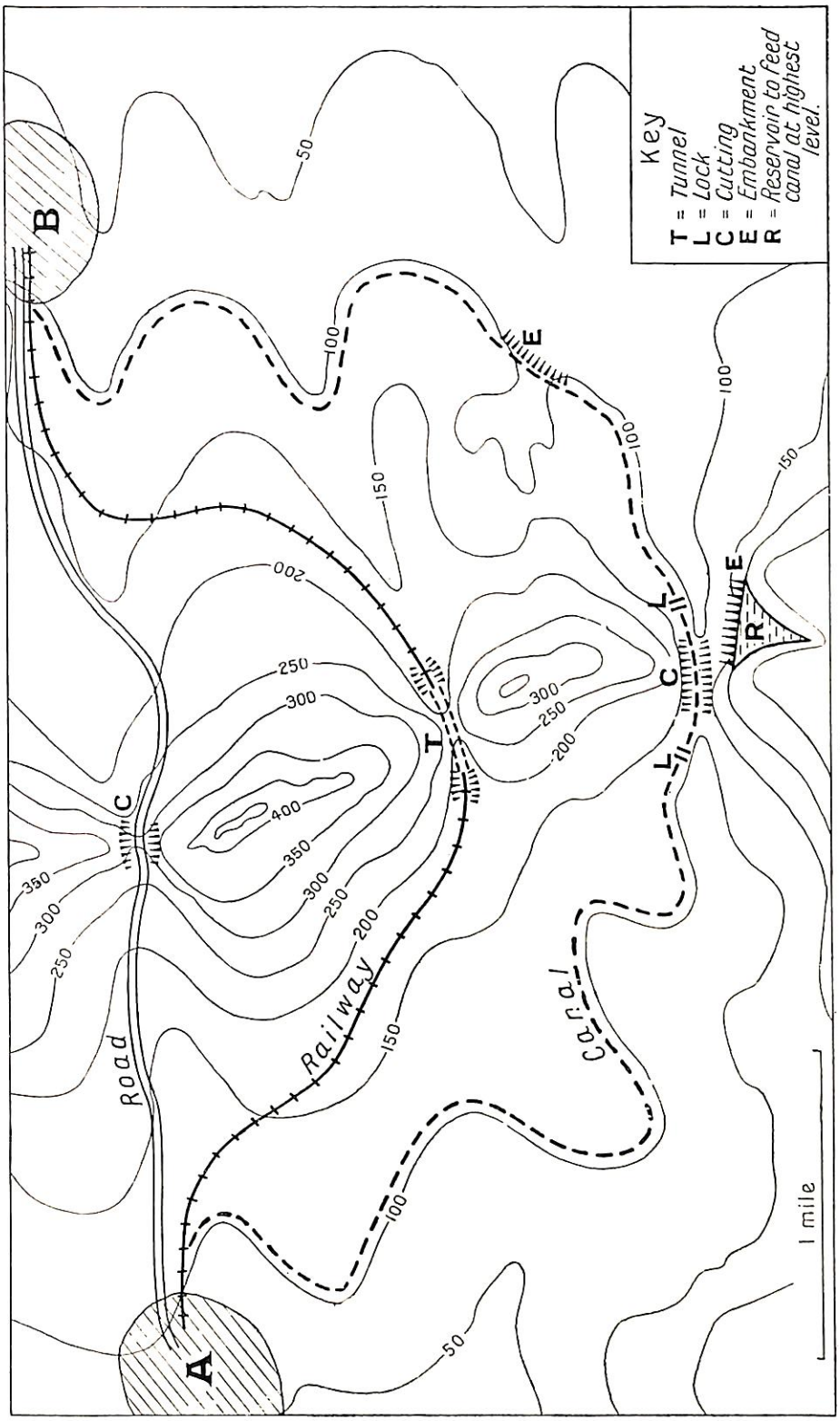

Key
T = Tunnel
L = Lock
C = Cutting
E = Embankment
R = Reservoir to feed canal at highest level.
A
B
Road
Railway
Canal
1 mile
50
100
150
200
250
300
350
400

FIG. 37

## STUDY OF A SIX-INCH MAP

The sketch below is from a model of the area shown on the 6-in. map opposite. Compare map and model, noting especially the high, level ground, the steep slopes, and the valley floors.

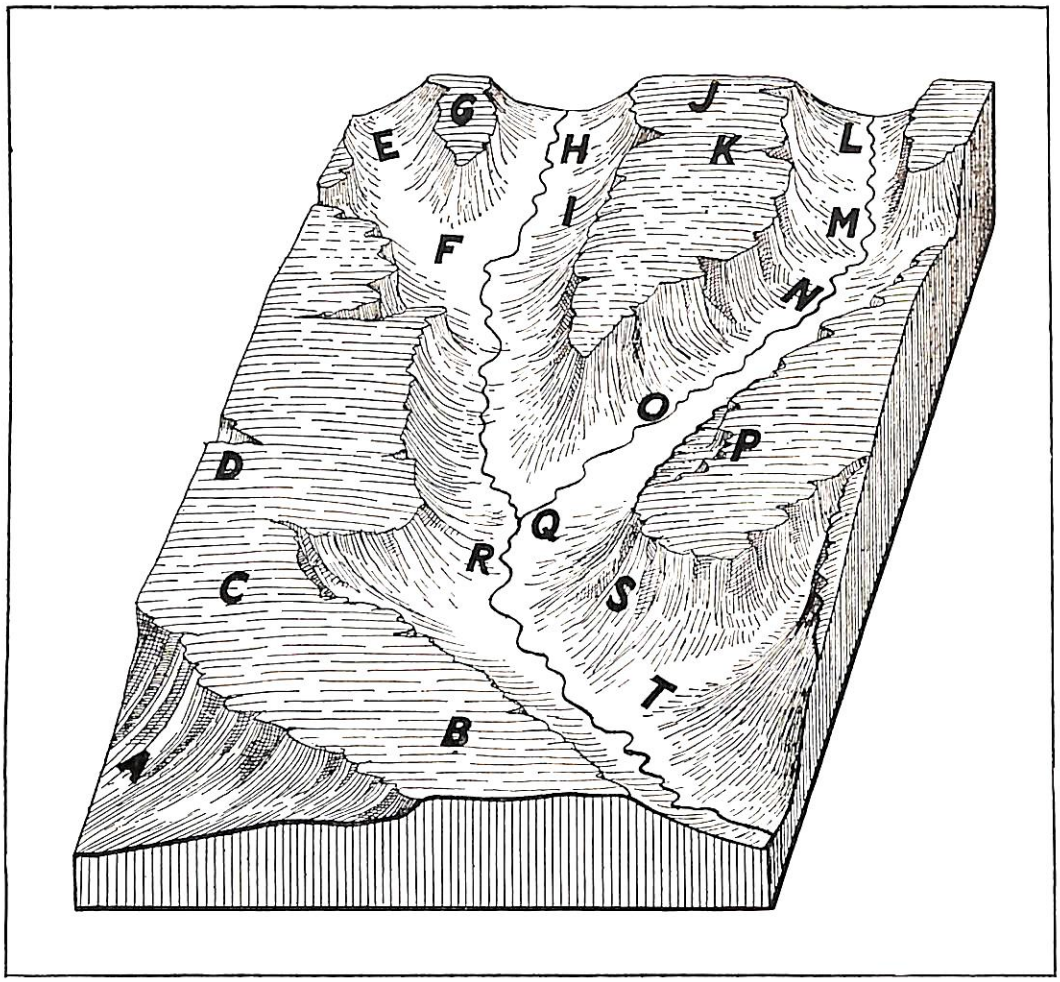



FIG. 38. BLOCK DIAGRAM OF BROXA. (*See also* plate opposite page 25)

## EXERCISES

(1) List the names which are printed on the map at the points: A, B to C, D etc. to T.

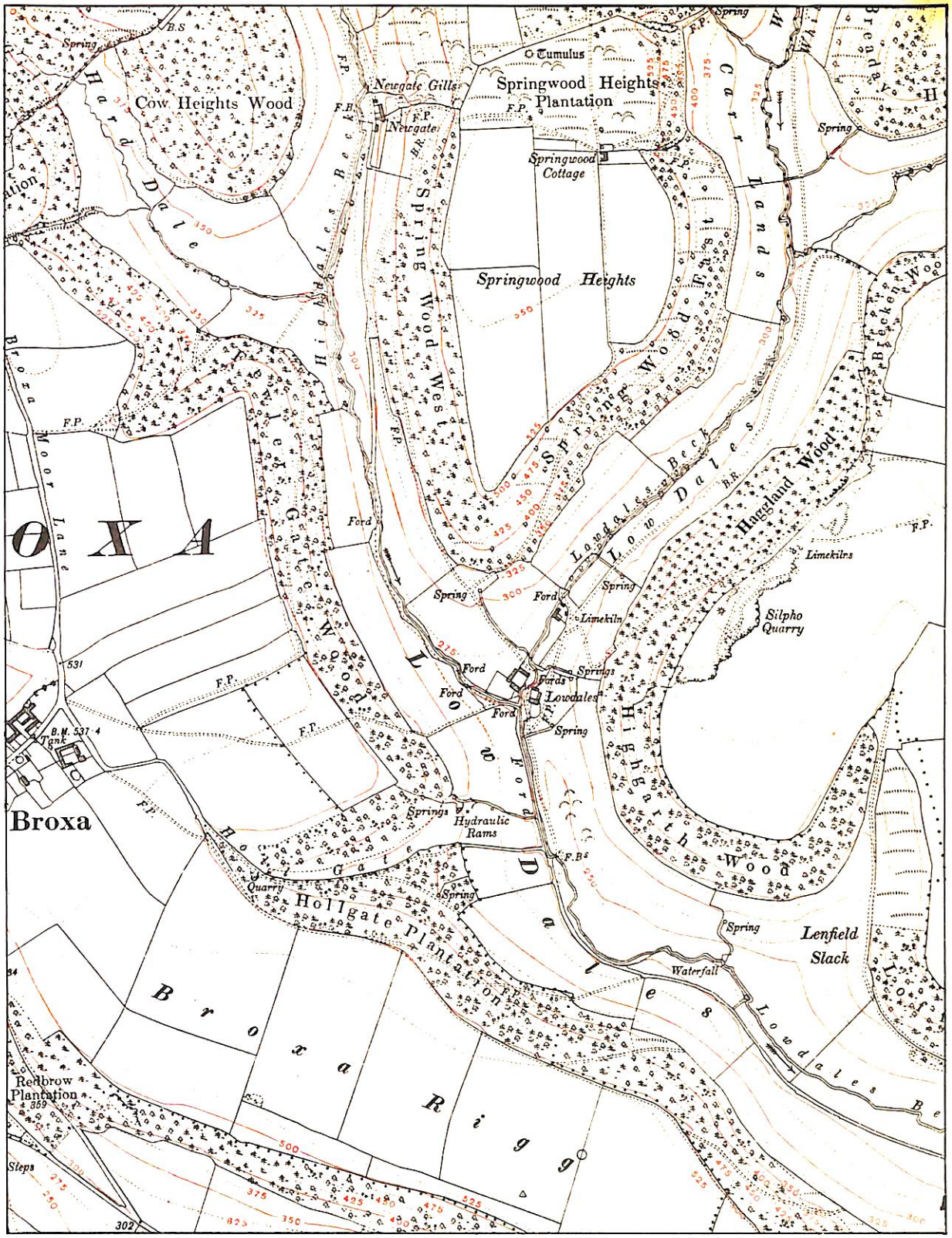
(2) Find the following features on the map: Cow Heights Wood; Springwood Heights; Broxa Rigg; Lenfield Slack. Select from the following descriptions the one appropriate to each of the features just named: A triangular, steep-sided, flat-topped spur; a narrow, V-shaped valley; a flat-topped, steep-sided ridge running from west-north-west to east-south-east.

(3) Find which drawing on pp. 7–12 most nearly represents the land forms of the area shown in the 6-in. Ordnance Survey map and in the block diagram, Fig. 38.

(4) Use a graduated circle similar to that made for Exercises 1 and 2, on p. 4, to find: (*a*) the compass directions, and (*b*) the angular bearings of the following points from the confluence of the streams at Lowdales: the tank at Broxa; the limekilns in Silpho quarry; Springwood Cottage; Newgate. Find also the distance of each of these places from the confluence of the streams.

(5) What features are situated at the following bearings and distances from the confluence at Lowdales? (*a*) N. 144, 1,900 ft.; (*b*) N. 62, 1,800 ft.; (*c*) N. 9, 3,200 ft.; (*d*) N. 265, 2,700 ft.

(6) What is the meaning of the Ordnance Survey symbol situated 57·5 chains due south-east of the tank at Broxa?




*Scale — Six Inches to One Statute Mile or 880 Feet to One Inch — 1/10560*

10 Chains 5 0 10 20 30 40

1000 Feet 500 0 1000 2000

1 Furlong 0 ½ ½

*R.A.F. Official Photograph.* *Crown copyright reserved*

AIR MOSAIC OF BROXA DISTRICT

*(See map facing page 24)*

(7) From Springwood Cottage go 600 yds. to the south-east, and from the point you reach go 800 yds. to the south-west. What point do you reach?

(8) One of the sections in Figs. 39 A and 39 B is drawn along the northern edge of the map opposite p. 24, and the other along the southern edge (the sections are slightly reduced in size)? (*a*) Say which section is the northern one and which the southern. (*b*) On tracings of the sections write in the correct positions the names: Cow Heights Wood, Springwood Heights Plantation, Breaday, Broxa Rigg. (*c*) Draw small trees on the parts of the sections which are wooded.


FIG. 39 A

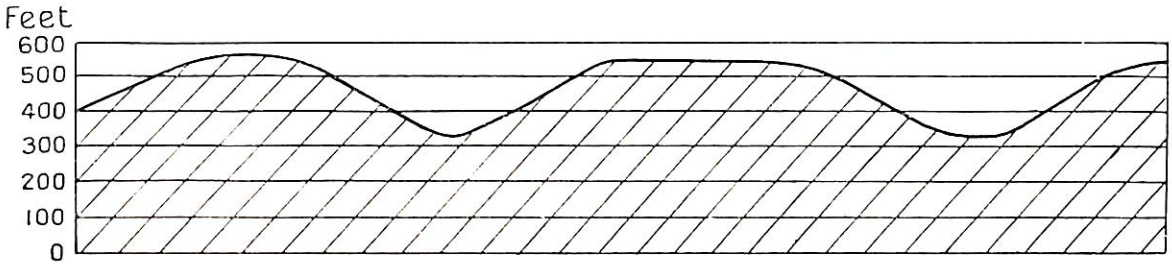



FIG. 39 B

(9) Fig. 40 is a sketch section of the footpath from Broxa to Lowdales. Draw similar sections of (*a*) the path from Broxa to Newgate; (*b*) the most direct footpath from Lowdales to Springwood Cottage; (*c*) a direct line from Springwood Cottage to Lenfield Slack.

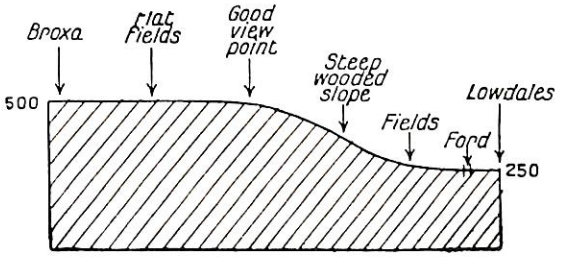



FIG. 40

(10) Find the name of a wood which is almost entirely coniferous, one which is almost entirely deciduous, and one which is about half and half.

(11) In this and other districts springs often occur, as shown in Fig. 41, at the junction of a layer of pervious rock (i.e. one which will let water through) with an impervious layer. The position of a spring on the map is shown by a little circle near the word 'spring.' Find all the springs you can on the map, note their heights, and then complete the following sentence: 'The springs in the area of the map occur at heights varying from .....ft. to ..... ft., at the junction of the .....ious limestone with the underlying .....ious shale.'


FIG. 41

(12) Compare the valley north of the words Lenfield Slack with Lowdales valley, above Lowdales, by arranging the following phrases into three columns headed thus: *Applying to both. Lenfield Slack only. Lowdales only.* Runs from north-east to south-west; runs from north to south; steep-sided; V-shaped; U-shaped; like a gully cut into the edge of the plateau; like a deep trench cut through the plateau; has no river; valley floor slopes very steeply to the south; valley floor slopes very gradually to the south-west; both sides are wooded; one side only wooded, the other rough pasture.

(13) What evidence is there that the rock which composes the high land is limestone?

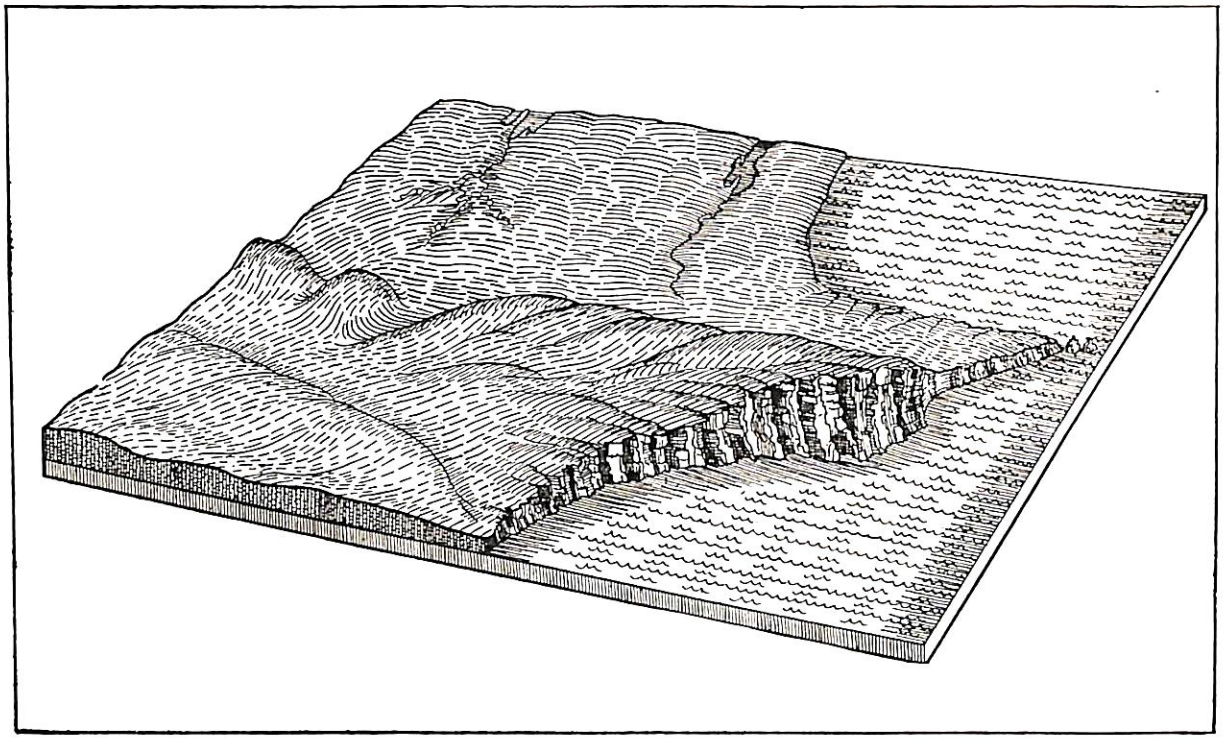


FIG. 45. BLOCK DIAGRAM OF BALLARD DOWN. *(See also* plate facing page 29)

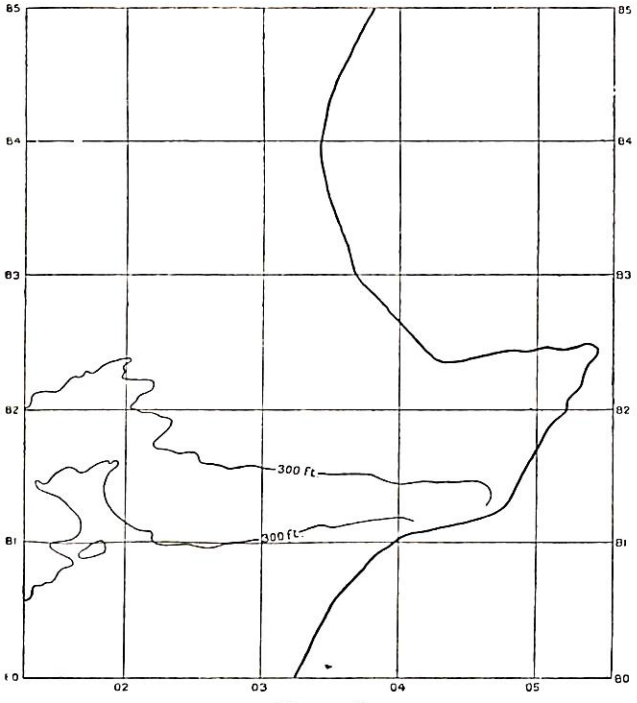



FIG. 46

## EXERCISES

(1) Compare the $2\frac{1}{2}$-inch map opposite with the block diagram above and the picture facing page 29, then make a tracing of Fig. 46, which shows the coast-line and the 300-ft. contour. On this tracing write at the appropriate places: (*a*) Steep-sided, hog-back ridge. (*b*) Undulating lowland below 100 ft. in height (two areas). (*c*) Gap through the ridge. (*d*) Vertical cliffs over 300 ft. in height. (*e*) Nearly vertical cliffs 200 ft. to 300 ft. high. (*f*) Steep earth-slopes less than 100 ft. high. (*g*) Beach of sand and shingle. (*h*) Sandy area above high tide.

(2) Using a vertical scale of one-tenth of an inch to 100 ft., draw a section along the grid line O3 on the Ordnance Survey map.

(3) On another tracing of Fig. 46 mark: (*a*) The main road to Studland from the west. (*b*) The motor road from New Swanage (0380) to Studland. (*c*) In two marshy valleys write the word 'marsh.' (*d*) Mark R for the position of a reed bed; F for furze; and P for rough pasture. (*e*) Mark with a letter T every point where a tumulus is found. (A tumulus is a mound erected in prehistoric times, usually over the grave of some important person.)


Yards 1000 500 0 1000 2000 3000

Scale 1:25,000 or about 2½ Inches to 1 Mile

*R.A.F. Official Photograph. Crown copyright reserved*

AIR MOSAIC OF BALLARD DOWN

*(See map facing page 28)*

*R.A.F. Official Photograph. Crown copyright reserved*

AIR MOSAIC OF MIDDLE HOPE

*(See map facing page 36)*

## EXERCISES

(4) Fig. 47 is a sketch section of the path from the Works (020811) to Redend Point (038828).

Compare the sketch with the map, then complete the sketch section in Fig. 48, adding as much detail as possible.

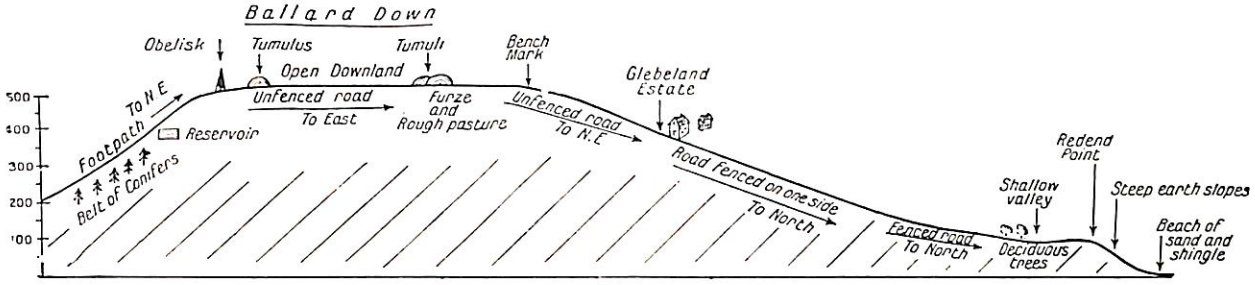



FIG. 47

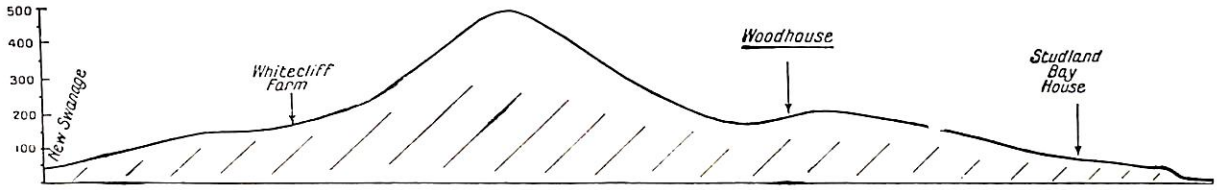



FIG. 48

(5) Fig. 49 is a sketch in the style of the 'strip maps' of the great English map-maker, Ogilby, who mapped the main roads of England. Make an enlarged copy of the strip, and add such other details as you think interesting.

Draw similar strip maps of walks from New Swanage via Studland to Littlesea (0384), and from Godlingstone Hill (0181) via Ballard Down to the headland in 0582.

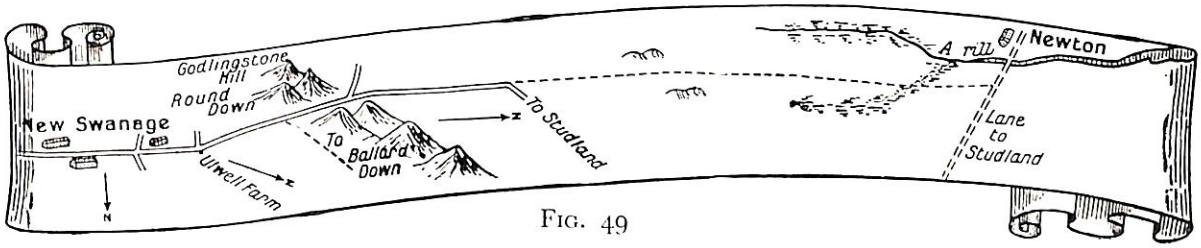



FIG. 49

## GRID EXERCISES

(1) Ballard Point is in the square whose western edge is formed by grid line 04, and whose southern edge is formed by grid line 81. The kilometre reference of the square is, therefore, 0481.

Ballard Point is eight-tenths from the western edge of the square, i.e. 04·8. It is three-tenths from the southern edge of the square, i.e. 81·3. Its full reference, therefore, might be written 04·8/81·3, but the correct form (100-metre reference) is 048813.

Give the six-figure, 100-metre references for the following points:

| *Place* | *Agglestone* | *Puck Stone* | *Brand's Ford* | *Manor House* | *Ulwell* |
|---|---|---|---|---|---|
| Kilometre reference | 0282 | 0283 | 0284 | 0382 | 0280 |
| 100-m. National Grid reference | 02?82? | ? | ? | ? | ? |

(2) Find the names whose initial letters are found at the following points: 029821; 022813; 038828; 022828. (The initial letters, in this order, form a word.)

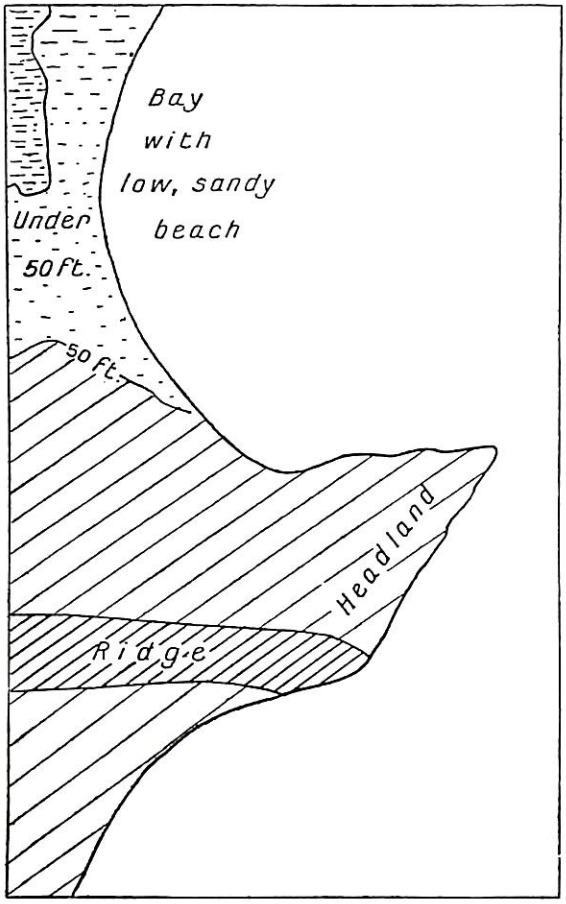



FIG. 50

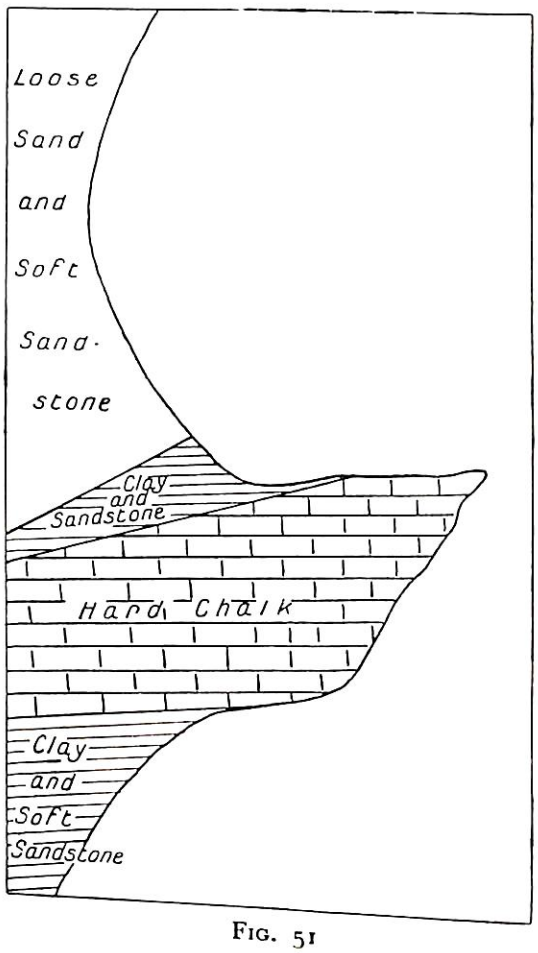



FIG. 51

## THE POSITION OF STUDLAND

The sketch map, Fig. 53, shows the following features which help to account for the growth of Studland:

(1) An area of cultivable land between the rough pasture of the downs and the barren heathland.

(2) A low ridge running eastwards to the sea.

(3) Deep gaps in the steep earth-slopes, making easy ways down to the sandy beach.

(4) The local routes converging on Studland.

The cross is marked on the map in Gothic lettering, indicating that the site is an ancient one. (The church dates from Norman times.)

Other points which can be noted on the Ordnance map are:

(1) The absence of pier, jetty, breakwater, etc., indicating that Studland is of no importance as a port or fishing station.

(2) The absence of promenade and of houses on the sea front indicating that it is not a major holiday resort.

(3) The prominence of the church, manor house, and rectory, and the scattered distribution of the houses, suggesting that it is primarily an agricultural village.

(4) Features which make Studland attractive as a minor holiday resort and residential centre: the downs, the pinewoods, the heath, the cliffs, and the sandy beach, which give varied scenery. A drawback to its development is the absence of a railway.

## RELATIONSHIPS

The sketch maps (Figs. 50, 51, 52) show the relationship between the kind of rock and the physical features.

Fig. 50 shows that where high land comes to the coast a headland is formed; where low-land comes to the coast a low, level bay is formed.

Fig. 51 shows that the hard rock (hard chalk in this case) forms high land, while the softer rocks (clay and soft sandstone) form lowland.

Fig. 52 combines the relationships shown in Figs. 50 and 51, and also shows that the hard chalk forms vertical cliffs, while the clay and soft sandstone form steep earth-slopes.

Fig. 53 shows the relationships between the physical features, the site of the village, the course of the roads, and the areas of cultivated land around Studland.

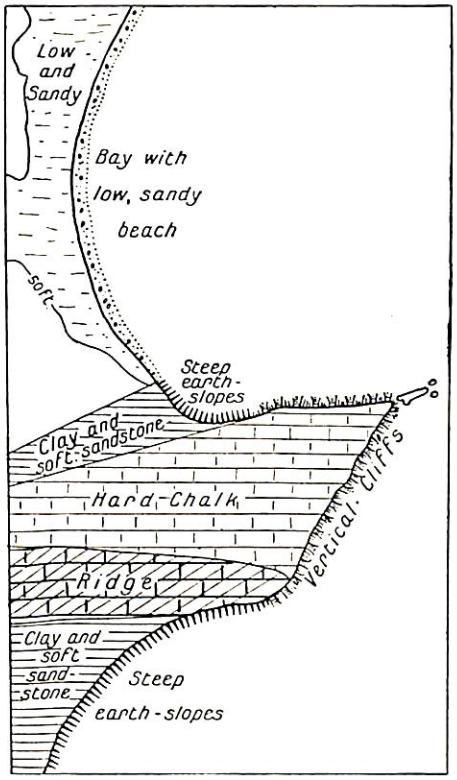



FIG. 52

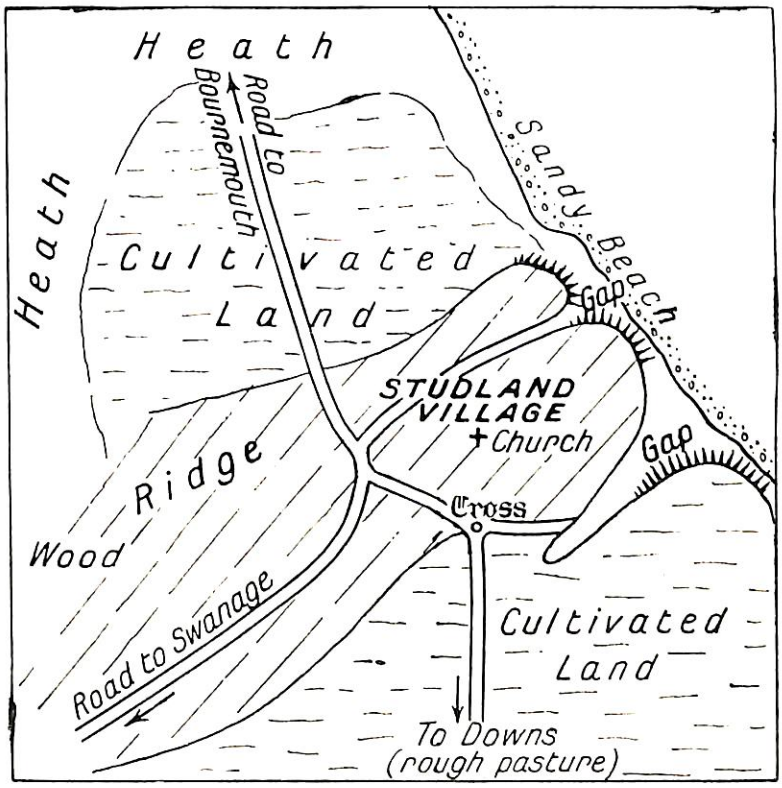



FIG. 53

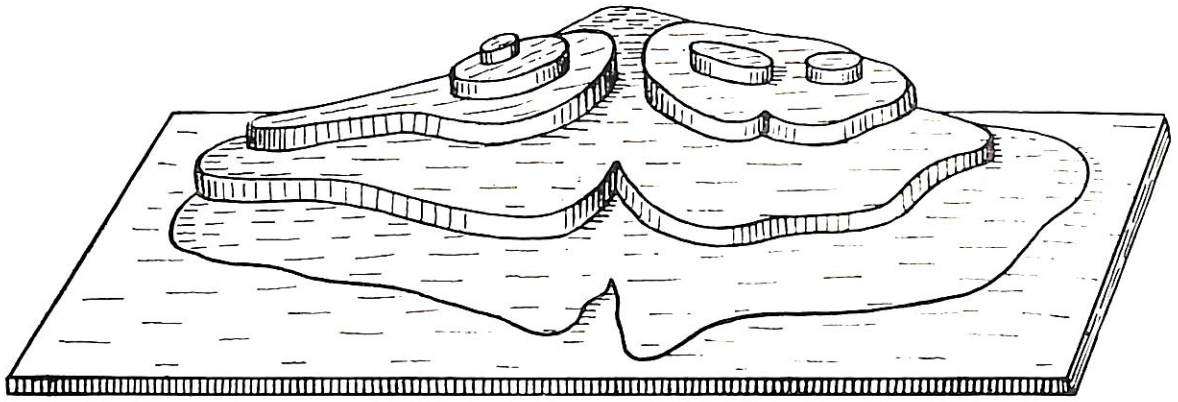


FIG. 54

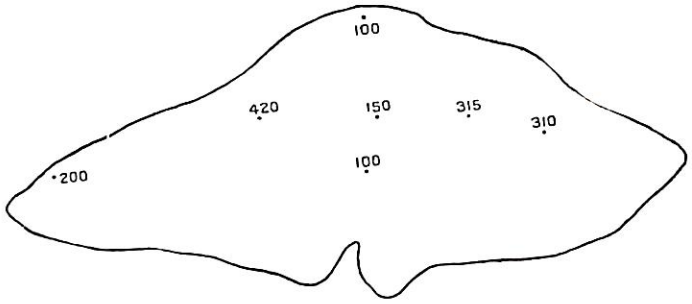



FIG. 55

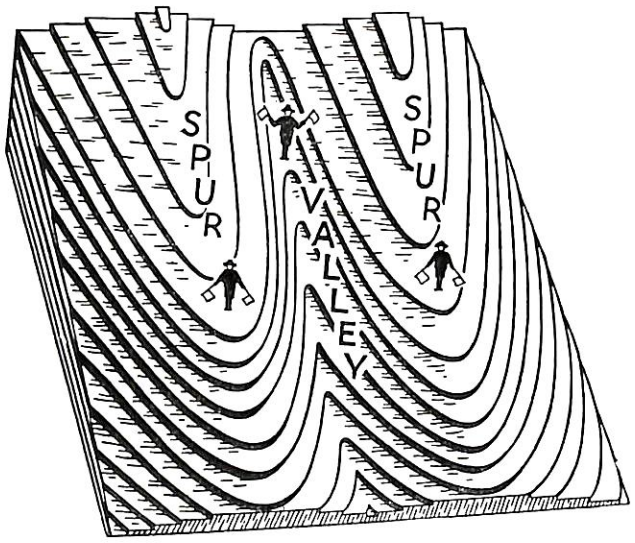
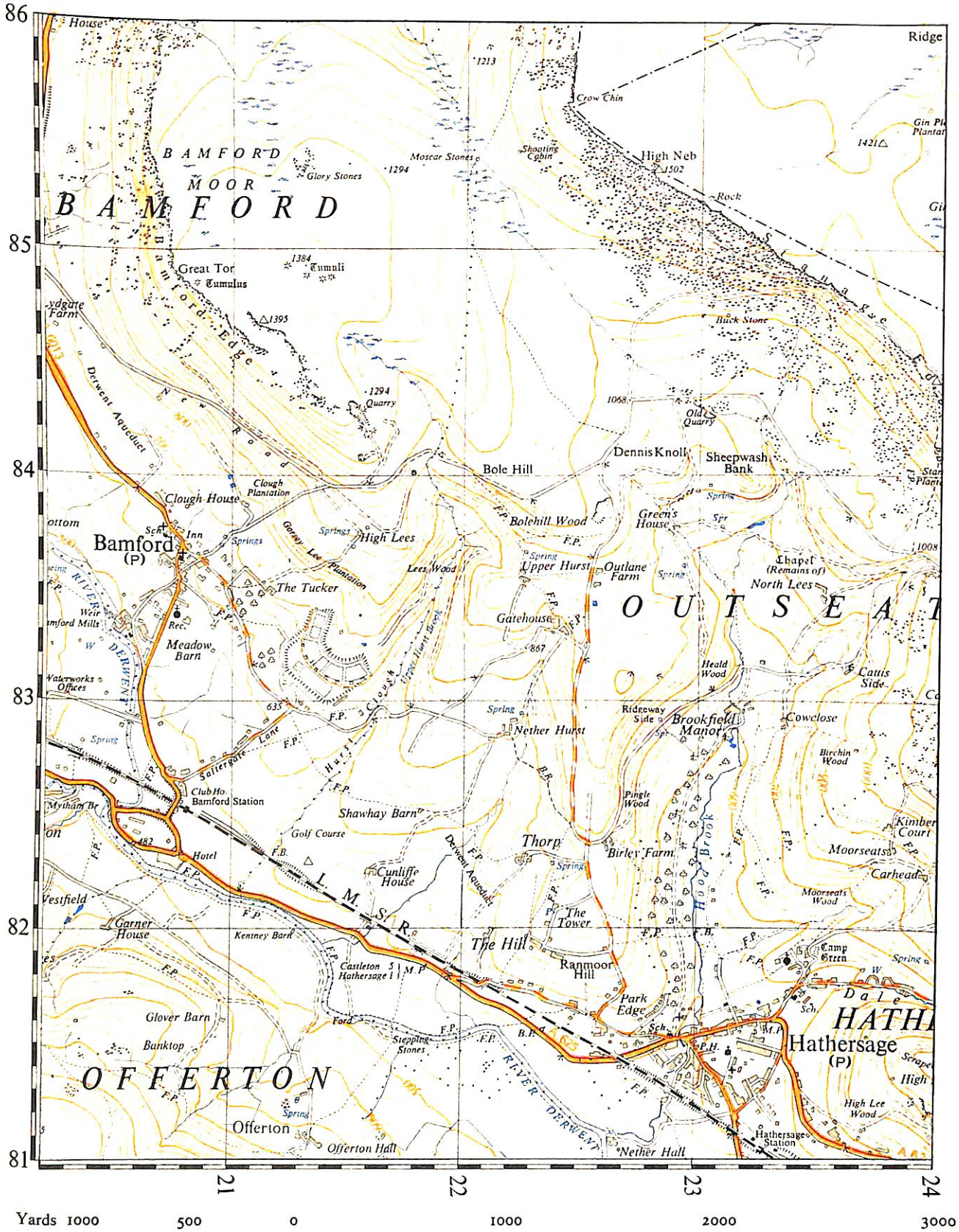



FIG. 56

Fig. 54 shows another method of making a model from a contour map. The contours are traced on separate sheets of cardboard or plywood, which are cut to the shape of the contours and raised to the required height. The spaces between are filled in with modelling material. If the contours are drawn very closely so that a great many thin sheets of card are used, as in Fig. 56, no filling material will be needed. (In the figure the flags indicate the slope of the ground.)

Fig. 55 is a map of the island shown in Fig. 54, with spot heights. Draw the contours at 50-ft. intervals.




Scale 1:25,000 or about 2½ Inches to 1 Mile

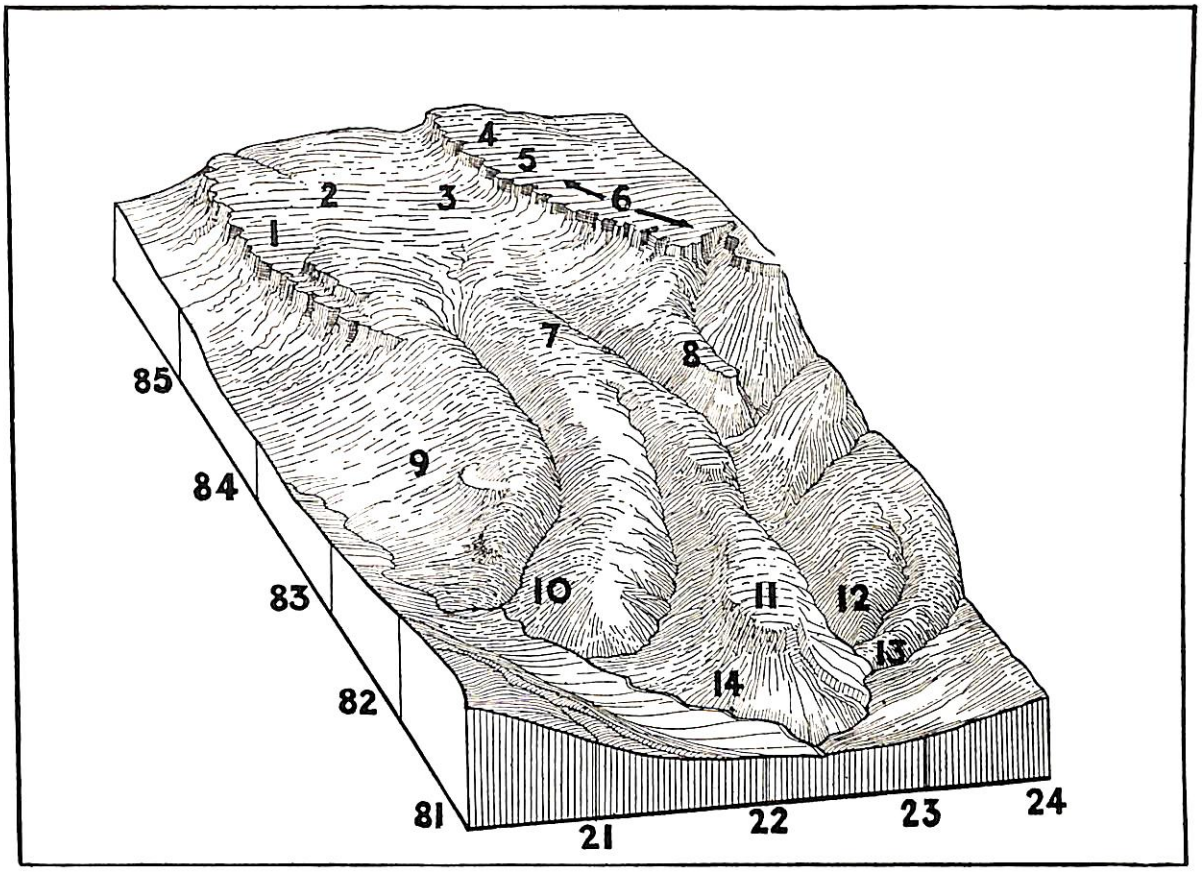



FIG. 57. BLOCK DIAGRAM OF THE HATHERSAGE DISTRICT
*(See also* photograph opposite page 2)

*Exercises:*

(1) Compare the $2\frac{1}{2}$-in. map of the Hathersage district opposite with the block diagram above. Identify the features numbered 1 to 14. They are as follows, though not in that order:

| | | | |
|---|---|---|---|
| River Derwent | Stanage Edge | High Neb | Bole Hill |
| Hurst Clough | Camp Green | Moscar Stones | The Tower |
| Great Tor | Bamford Filters | Sheepwash Bank | Crow Chin |
| | Glory Stones | Hood Brook | |

(2) Write down from the map the names or numbers of the following features:

Square 2184: a trigonometrical station
2084: prehistoric remains
2184: evidence of hard rock
2285: a building
2383: an antiquity
2183: mixed coniferous and deciduous wood
2181: two means of crossing the river
2281: a building at a confluence
2381: an antiquity

(3) Give four-figure, kilometre square references for: Bamford village; Hathersage village; a cutting on the railway; a road bridge over the railway; a railway bridge over the road (two examples); a railway embankment (three examples).

(4) Give six-figure (100-metre) references for: Offerton village; a church at Hathersage with a spire; two churches at Hathersage without either spire or tower; a bench mark in square 2383; two spot heights in square 2184.

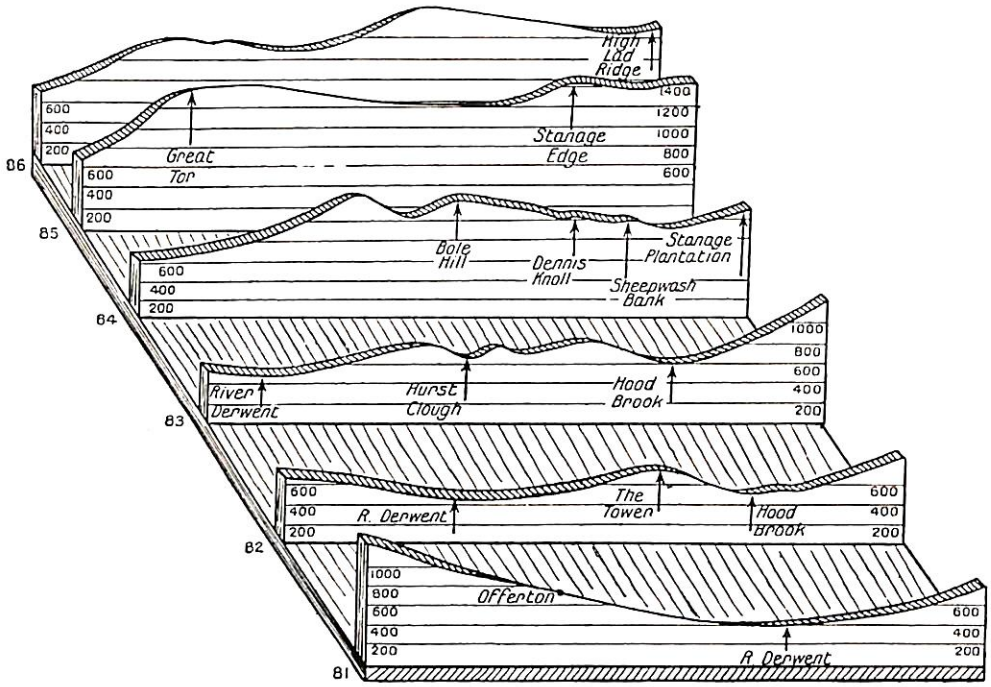



FIG. 58

(5) Make a model of the district shown on the Hathersage map by cutting the above sections out of wood or stiff cardboard, mounting them on a board as shown, and filling in the spaces with modelling material. Greater accuracy will be ensured by making intermediate sections at $\frac{1}{2}$-in. intervals, as well as side sections. Even so, constant reference to the map is needed when modelling the surface.

(6) The following are sections along the lines marked by the double-headed arrows in Fig. 60. By reference to the map identify each section and mark it by letters on a copy of Fig. 60.

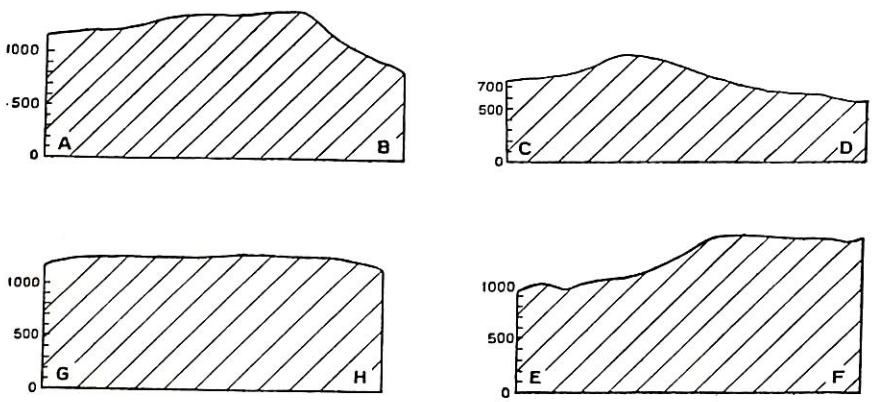



FIG. 59

(7) Fig. 60 gives the 800-ft. and the 1,200-ft. contours from the Hathersage map, reduced to a scale of 1¼ in. to 1 mile. Make a copy of this, and on it write at appropriate places:

Steep, craggy scarp slope (two cases).

Gently sloping dip-slope or plateau (two cases).

Deep, narrow, steep-sided valley (four cases).

Steep-sided V-shaped spur (at least three cases).

Steep-sided, blunt-nosed spur.

Broad, deep, flat-bottomed valley.

Shallow, gently sloping, marshy upland valley (four cases).

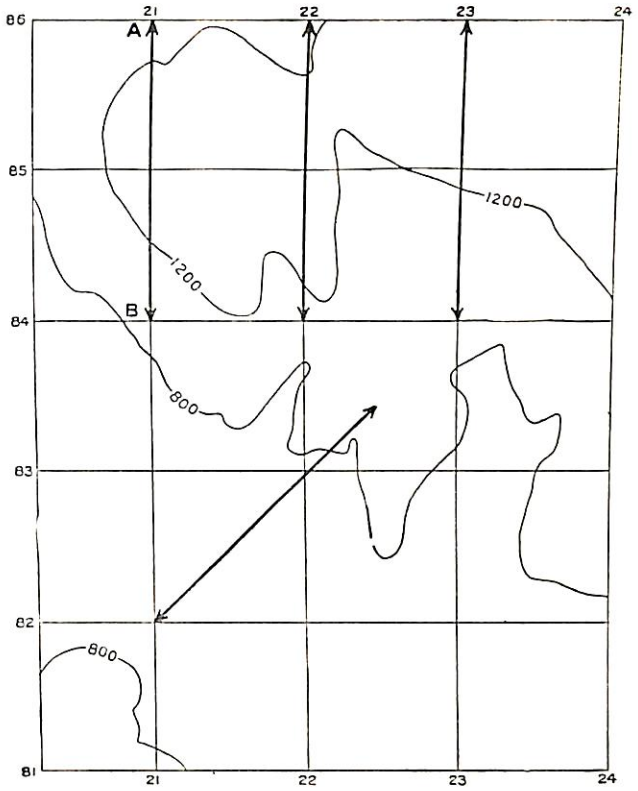



FIG. 60

## ADDITIONAL EXERCISES

(1) Find which squares agree with the following descriptions (the squares are 2084, 2181, 2282, 2281, 2284, though not in that order): (*a*) With the exception of a steep, craggy slope in the extreme north-eastern corner, the square is entirely occupied by a broad, shallow, upland valley. (*b*) The square is almost entirely occupied by a steep-sided spur running from north to south. (*c*) The north-eastern half is occupied by a low, broad, flat valley, the south-western half by a hillside sloping fairly steeply from 500 ft. to 900 ft. (*d*) The north-eastern half is occupied by the blunt end of a spur, the south-western half by a low, broad, flat valley. (*e*) From the south-west corner the land slopes upwards first gradually then very steeply towards the north-east corner, which is crossed by a steep, craggy slope above which is a flattish area with a tumulus.

(2) Enlarge the following sketch section and strip-map of the walk from Bamford to Stanage Edge, Figs. 61 and 62, and add interesting details to each.

(3) Draw a sketch map to show the position of Hathersage in relation to the valleys.

(4) Make a sketch map of the road from Park Edge (2281) to Dennis Knoll (2284), marking with a thick line those parts which are too steep to cycle.

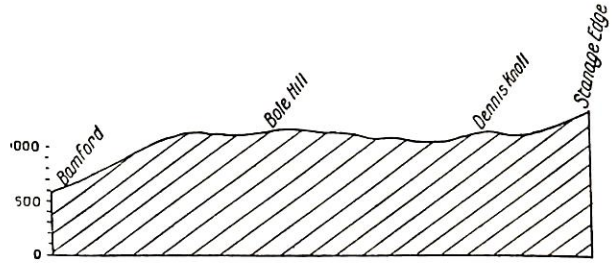



FIG 61

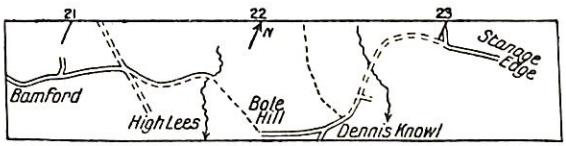



FIG 62

## THE NATIONAL GRID SYSTEM. (*See also* page 21)

The grid lines on the 1-in. map opposite are drawn at intervals of 1 kilometre. As we have seen (p. 21), they enable us to give a reference for any particular point.

The simplest type of reference is:

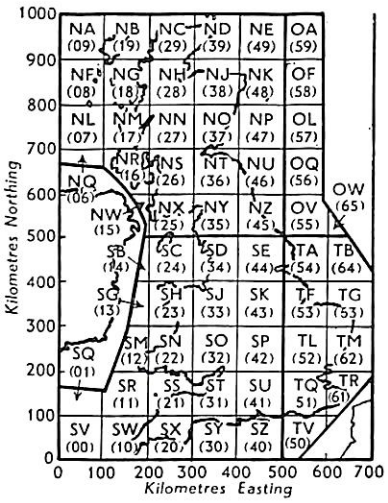



FIG. 63

The **kilometre reference,** which gives us a particular square on this particular map, e.g.:

The kilometre reference of Sand Bay is 3264.

The kilometre reference of Woodspring Bay is 3566.

The kilometre reference of Locking village is 3659.

The **100-metre reference** tells us not only which kilometre square a point is in, but also where it is in that square. Sandpoint Farm is in square 3365; i.e. its kilometre reference is 3365.

It is about two-tenths of a kilometre from the west side of the square, so we add a 2 after the 33 making 332/65. It is about seven-tenths of a kilometre from the south side of the square, so we add 7 after the 65, giving the 100-metre reference 332657.

The **Full Grid Reference** is the 100-metre reference preceded by the letters or numbers of the particular 100-kilometre square of Fig. 63.

In every square of this map there is a point whose 100-metre reference is, say, 123456 (or any other six-figure number); but there is only *one* point whose Full Grid Reference is SP123456 (or 42/123456).

The figures on the Ordnance Survey map opposite which tell us the number of the 100-kilometre square are the small 3 before the vertical line 30 ($^{3}30$) and the small 1 before the horizontal line 60 ($^{1}60$). From these we know that the map is part of the square 31 (or ST) in Fig. 63. Hence the Full Grid Reference of Sandpoint Farm is 31/332657, or ST332657.

*Examples:*

| *Reference* | *Kilometre* | *100-Metre* | *Full Grid Reference* |
|---|---|---|---|
| Warren Farm | 2956 | 297565 | ST297565 or 31/297565 |
| Martin's Hill Farm | 3054 | 305547 | ST305547 or 31/305547 |
| Castle Batch | 3663 | 362637 | ST362637 or 31/362637 |

Given the full National Grid reference, you can pin-point any place on the map of Britain.

The figures of this reference tell us the exact position of the points on the map of Britain. Thus, Castle Batch is 336·2 kilometres east of point OO in Fig. 63, and 163·7 kilometres north of it.

### EXERCISES

(1) Find the point whose 100-metre reference is 349556. Group the figures in your mind thus: $\frac{V}{34\cdot9}, \frac{H}{55\cdot6}$, where V stands for the vertical line forming the west side of the square and H stands for the horizontal line forming the south side of the square.

(2) Find the names whose initial letters are at the following 100-metre reference points: (*a*) 334651; (*b*) 297570; (*c*) 345545; (*d*) 371592; (*e*) 337661. If you have found the names correctly the initial letters will form the name of an animal.

(3) Make a table similar to the one above these exercises giving the four sets of references for each of the following points (kilometre references in parenthesis):

Batch (3355); Motte and Bailey (3660); Tumuli (3657); Tower (3466); Ebdon (3664); Rhynemoor Farm (3455).


Scale : One Inch to One Statute Mile · 1/63360

1 ¾ ½ ¼ 0 1 2 3 4 5 Miles

1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 Yards

## WESTON-SUPER-MARE

As shown in this key diagram, the area covered by the 1-in. map opposite p. 36 consists of a lowland crossed by three ridges of highland.

Check and complete the following statements by referring to the map:

(1) Nearly all the lowland area is flat and less than 50 ft. above sea level.

(2) The ridges rise steeply from the lowland and from the sea: Bleadon Hill to a height of ——ft., Brean Down to ——ft., Worlebury Hill to ——ft., and Middle Hope to ——ft.

(3) The lowland is fringed by sandy or muddy bays, the ridges run out to sea to form headlands.

(4) The ridges are without streams. (This is because they are formed of limestone, which lets the rain-water soak through.)

Seaward of each headland is a feature which shows that the cliff formerly extended farther out to sea: Howe Rock in the case of Brean Down; —— in the case of Worlebury Hill; —— in the case of Middle Hope.

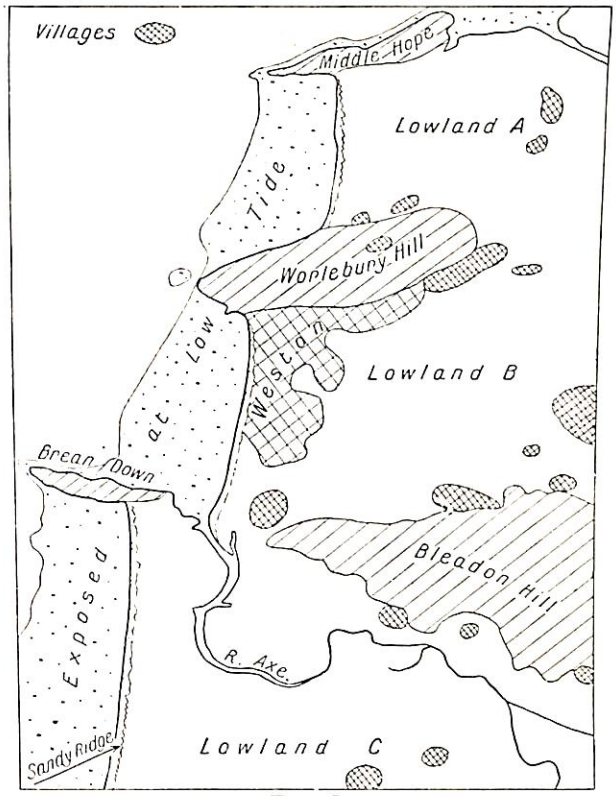



FIG. 63

(5) The land over 250 ft. is almost unpeopled. (This is because the limestone does not provide good soil of any depth.)

(6) With the exception of Weston-super-Mare, most of the settlements are situated at the foot of the highland.

(7) The River Axe is embanked to prevent the flooding of the lowland.

(8) The lowland is crossed by numerous drainage channels, showing that it was formerly swampy. The name Rhyne is often used for such a drainage channel. Find how many times the name occurs on the lowland.

(9) On the coast of the lowland there is a sandy ridge, rising above high-tide level. The ridge is firm enough to carry a road, and in places, as shown by the spot heights, it reaches heights over ——ft.

(10) The River Axe is not much used for navigation, as there are no swing bridges shown and no port at its mouth.

It is a very slow-flowing river, as shown by (*a*) ——, and (*b*) ——.

### EXERCISES

(1) Draw a sketch map of Weston-super-Mare showing: (*a*) Its position on a bay between two headlands. (*b*) The division of the town into a hilly part and a flat part. (*c*) The means of access to the town by road and rail. (2) List from the map features of interest to holiday makers. (3) What features on the map indicate that the area around Weston-super-Mare was occupied in pre-Roman times?

(4) Draw an annotated sketch map to show what seems to you to be the most interesting walk of not more than five miles from start to finish.

(5) What evidence can you see that Weston-super-Mare is a modern town?

(6) Compare Worlebury Hill and Brean Down from the points of view of height, coast-line, vegetation, human settlement.

(7) Note the ancient 'Field Systems' (2859 and 3357). Find out from a book on prehistoric Britain how these fields differ from modern ones.

## EXERCISES

(8) Picture this area in the days when all the lowland was flooded or swampy; in what respects would Brean Down and Worlebury Hill be excellent places of refuge in those days?

(9) Note the 'Motte and Bailey' (3660), and say why these were constructed there. (Note the contour.)

(10) What is the distance in kilometres in a straight line from Ebdon (3664) to Locking (3659)?

(11) Find: (*a*) The compass direction. (*b*) The angular bearings of the following points from the point 390 ft. in square 3358. (*a*) The church at Wick St. Lawrence (3665). (*b*) The Youth Hostel, 352589. (*c*) Honey Mead Farm, 340551. (*d*) Knightstone, 312618.

(12) Find in square kilometres the total area of land surface shown on the map. (Trace the coast-line and the kilometre squares as shown on a reduced scale in Fig. 64, mark out complete rectangular blocks of squares, and find their areas; now count each remaining whole and half square as in Fig. 5, p. 4.)

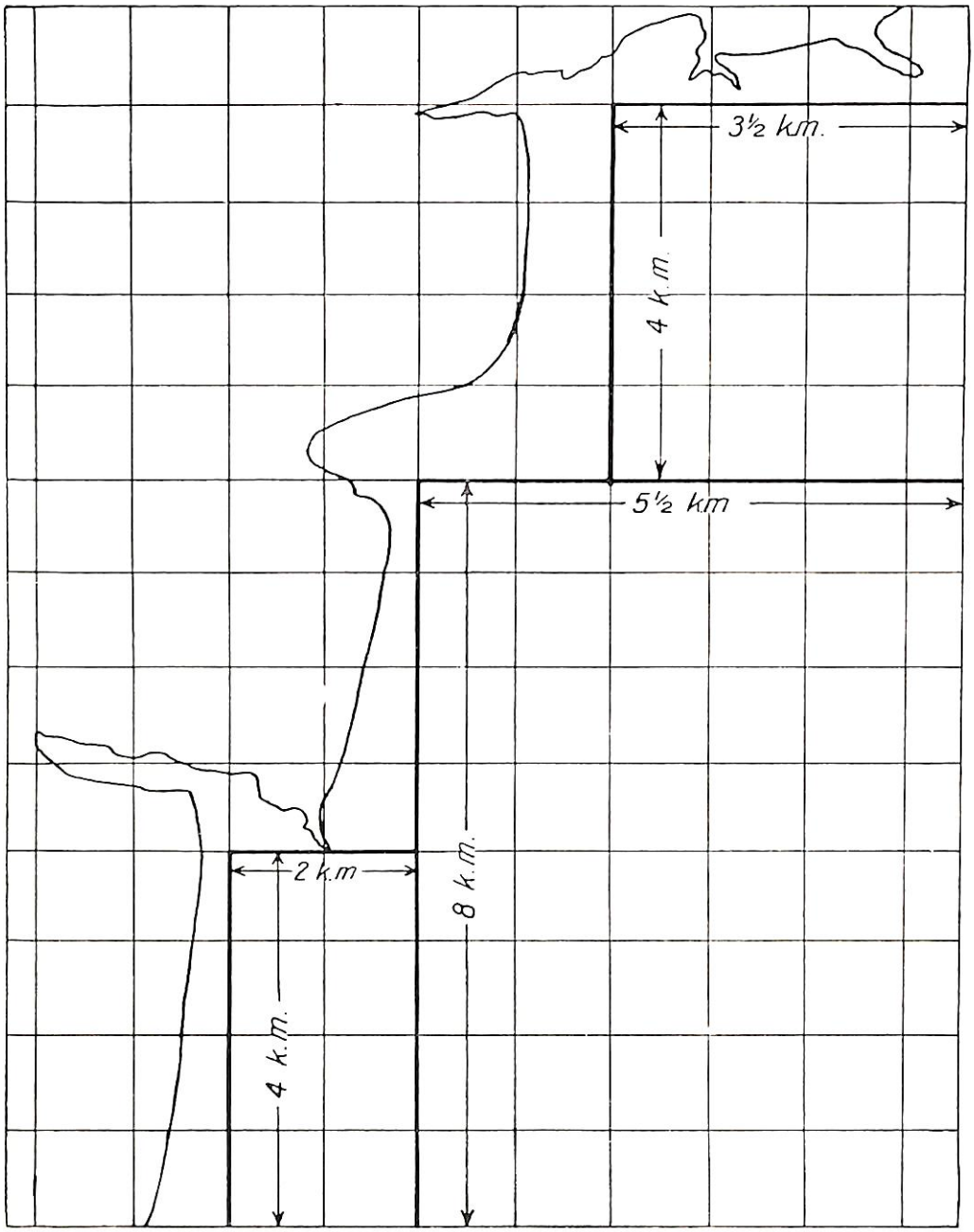



FIG. 65

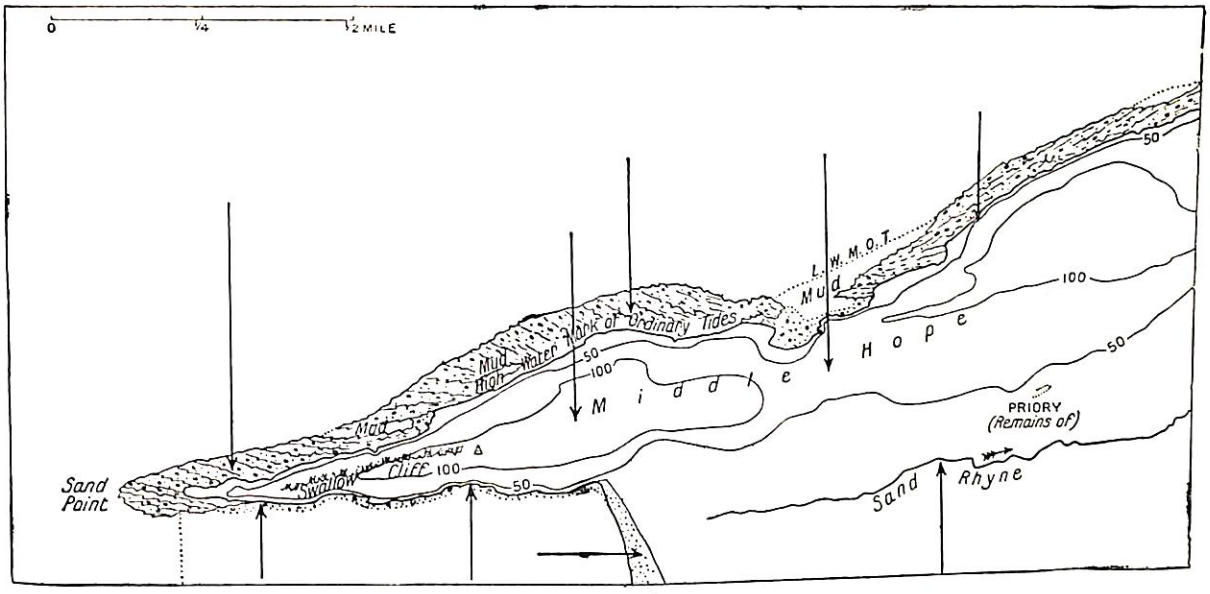



FIG. 66

The above map shows the contours and the features of the sea coast of Middle Hope.

Copy the map and annotate it by adding at the ends of the arrows appropriate descriptions selected from the following list. (A phrase may need to be repeated more than once.)

Flat rocks exposed at high tide.—Muddy beach at low tide.—Rock-strewn sandy beach at low tide.—Cliffs nearly 50 ft. high.—A dip in the skyline of the hill.—A craggy slope on the hill.—Gently sloping summit of hill.—A sandy beach exposed at low tide.—A drainage ditch.

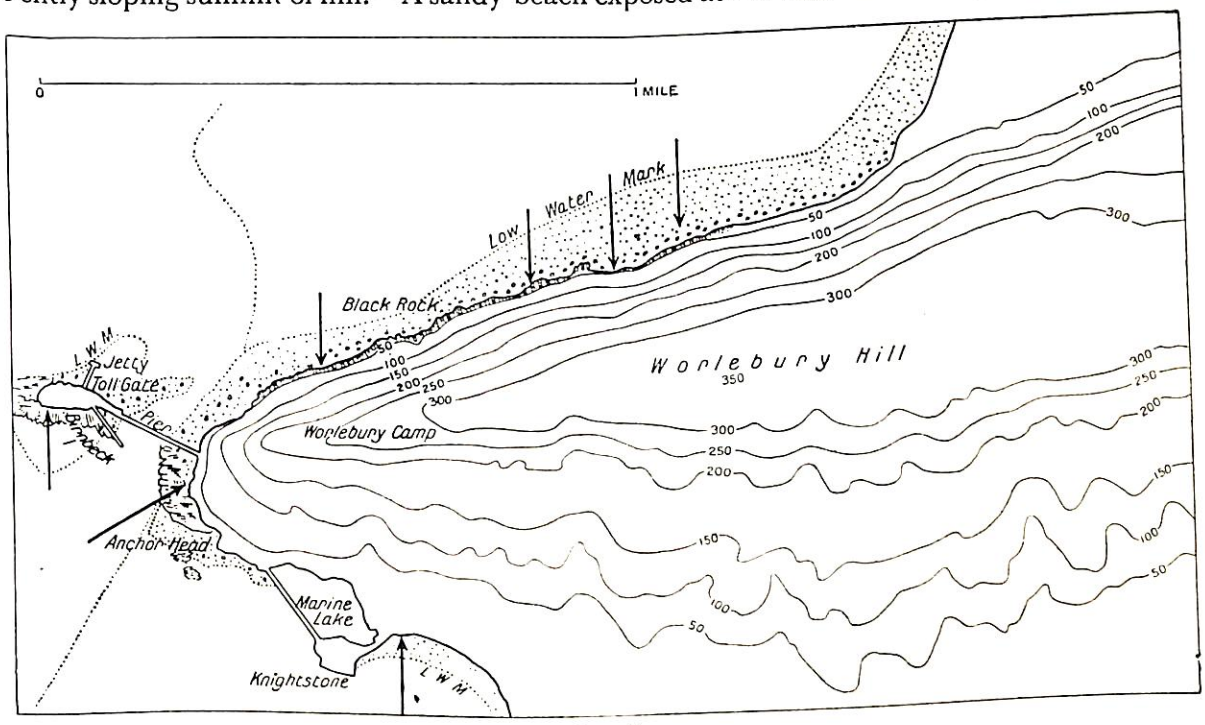



FIG. 67

The map above shows Worlebury Hill on the scale of 2 in. to the mile. Annotate the map with descriptions at the ends of the arrows as you did in the case of Middle Hope.

## BREAN DOWN

The map below, on the scale of 6 in. to 1 mile, shows the contours and features of the sea coast of Brean Down.

Copy the map, and annotate it by adding at the ends of the arrows appropriate descriptions selected from the following list. (A phrase may need to be used more than once.)

Steep earth-slopes attaining a height of more than 300 ft.
Flat rocks exposed at low tide and showing the former extension of the cliffs.
Foreshore of sand, shingle, and rocks.
Almost vertical cliffs, approximately 50 ft. high.
Highest point of headland.
A shallow valley cut off by the sea cliffs.

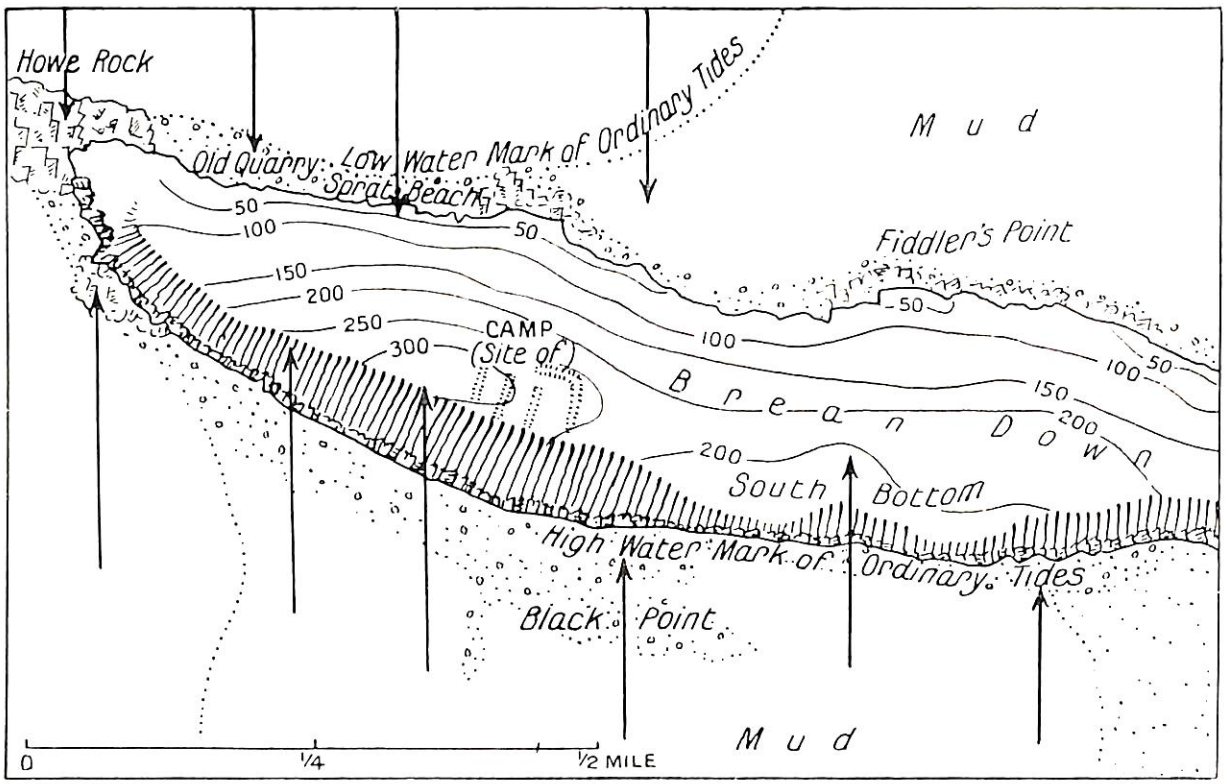



FIG. 68

## EXERCISES

(1) Describe, with the aid of a cross section, a walk from high-water mark near South Bottom to high-water mark near Fidler's Point.
(2) What advantages of site had the prehistoric camp on Brean Down?
(3) Compare the north coast of Brean Down with the south coast.
(4) Draw a contour map of a long, narrow island rising to 500 ft. near the centre and with steep earth-slopes 200 ft. high on the northern side and vertical cliffs rising to 100 ft. on the southern side.

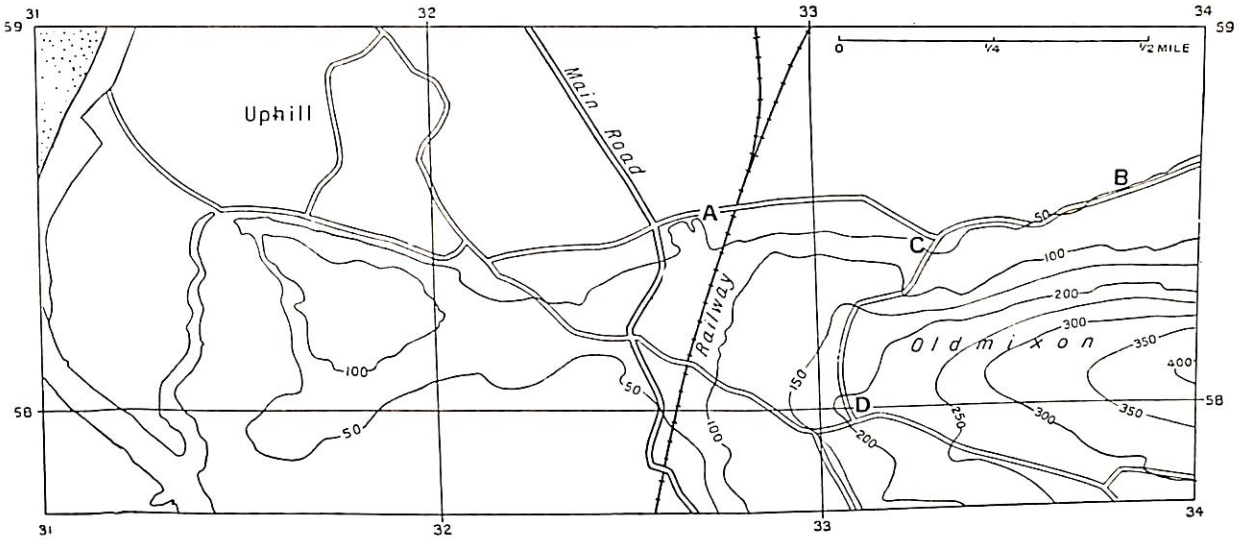



FIG. 69

The above map shows the contours, roads, and railway of the Uphill-Oldmixon district. Work the following exercises on the map or a tracing of it:

(1) By reference to the 1-in. map add the following: (*a*) In square 3158: two churches. (*b*) In square 3258: an electricity transmission line. (*c*) In square 3358: a wind pump, an orchard, and a trigonometrical station.

(2) Add the cutting on the railway, using the Ordnance Survey marking.

Why was the cutting made?

Why are there no cuttings for the roads?

(3) What is the relationship of the roads to the railway in squares 3257, 3258?

(4) What is the relationship of: (*a*) Road AB to the contours? (*b*) Road CD to the contours?

(5) Enlarge square 3158 to the scale of 3 in. to the mile.